

***SOURCE WASTE REDUCTION IN
TRANSPORT PACKAGING:***

AT TENNANT COMPANY

SPONSORED BY: THE MINNESOTA TECHNICAL ASSISTANCE PROGRAM

BY KATHRYN M. PETERSON

SUMMER 1997

ABSTRACT

Tennant Company, referred to as Tennant, is a world-wide manufacturer of non-residential floor maintenance equipment, floor coatings and related products. Tennant's corporate offices are located in northwest Minneapolis in Golden Valley. It is at this facility, where by Tennant's main operations exist for the manufacture of their industrial floor care equipment. The type of equipment manufactured at Tennant's Golden Valley facility are sweepers and scrubbers that range in size from a walk behind model up to large enough to clean streets. A few of the models are both sweepers and scrubbers.

Tennant purchases 60% of the parts that go on the machines from outside suppliers. Unfortunately, most of these parts come in single use corrugated cardboard boxes. Tennant wants to reduce the amount of waste coming in the door, at the source through the use of reusable transport packaging. In order to assess the amount of waste and possible candidates for reusable packaging a comprehensive list of part numbers, descriptions and manufacturers was gathered and information on different types of reusable packaging obtained. Once the right packaging was found for each part or supplier, the concept was communicated and discussed with the person or person's capable of implementing the idea.

Various types of reusable transport packaging was evaluated and used:

- Plastic pallet and corrugated cardboard sleeve boxes for plastic parts, motors, pumps and actuators
- Plastic totes for light plastic parts
- Corrugated plastic boxes for foam insulation parts

There are many options available to businesses today to help them to reach their source waste reduction goals for transport packaging.

The focus of Tennant's project is to reduce or eliminate transport packaging received from suppliers. However, as things progressed it became obvious that recycling is also important. I found that Tennant did not recycle their plastic and I found a company to do that. I also started a program to recycle the Tyvek™ paint suits and looked for a new company to take wooded pallets.

In addition, the following table summarizes the different projects initiated to implement reusable transport packaging. I also worked on implementing the recycling of plastic, Tyvek™ suits and wooden pallets. These results are summarized in the last section of the paper.

Supplier	Product Produced	Transport Packaging Option	Waste Reduced (amount)/ year	Raw Material Saved (amount)/ year	Implementation Costs	Pay-back Period (years)	Cost Savings	Status (implemented, recommended, not feasible)
Tennant	Side Sweep Brushes	Metal Spool Units	4.56 tons of cardboard	4.56 tons of cardboard	\$7,900	1.4	After pay back: \$5,800/yr	Recommended, Pilot tests being conducted
Tennant	Tubular Brushes	Reusable Cardboard Boxes	1.21 tons of cardboard	1.21 tons of cardboard	ND	ND	ND	Not Feasible at this time
Imperial Custom Molding	Variety of Injection Molded Plastic Parts	Plastic Totes	0.97 tons of cardboard	0.97 tons of cardboard	\$10,400	7.7	After Pay Back & Return Shipment: \$289/yr	Recommended, Waiting for approval of funds
Applied Power Products	Variety of Foam Parts	Corrugated Plastic Boxes	1.62 tons of cardboard	1.62 tons of cardboard	\$4,050	3.7	After pay back: \$1,100/yr	Recommended, Waiting for negotiation of funds
Centro & Pawnee	Rotational Molded Parts	Pallet & Sleeve Boxes	32 tons of cardboard + 52.8 tons of wood	32 tons of cardboard + 52.8 tons of wood	\$43,800	0.69	After pay back: \$54,200/yr	Implemented
Flojet, Gorman-Rupp, MET, Ohio Electric, Von Weise & Warner	Motors, Actuators, Pumps & Shakers	Pallet & Sleeve Boxes	3.01 tons of cardboard + 6.38 tons of wood	3.01 tons of cardboard + 6.38 tons of wood	\$15,000	0.48	After pay back: about \$27,000/yr	Recommended, In process of working out details with suppliers

Supplier	Product Produced	Transport Packaging Option	Waste Reduced (amount)/ year	Raw Material Saved (amount)/ year	Implementation Costs	Pay-back Period (years)	Cost Savings	Status (implemented, recommended, not feasible)
Parker	Hoses	-	-	-	-	-	-	Should be looked at in the future
Unidex	Protective Bags	Woven Polypropylene Bags	0.56 tons of polypropylene	0.56 tons of polypropylene	\$6,000	ND	ND	May be Considered in the Future

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TENNANT COMPANY BACKGROUND

Tennant Company began in 1870 making wooden products including floors. In 1909 it became a corporation and began to grow. By 1938 they had changed their focus to floor-care machines and added floor-care products for wooden floors to create the Tennant Floor Maintenance System. Tennant began to sell sweepers in 1949. In the 1960's Tennant began to expand to a global market and became a public company in 1969. A partnership with Japan helped foster Tennant's commitment to quality and customer satisfaction. In 1970 Tennant created a subsidiary, Tennant NV, based in Uden, the Netherlands to manufacture machines for the European market. The 1990's fostered the new business strategy for the 21st century, Preeminence 2000, and Tennant's current vision statement: *To work for a cleaner and safer world.* Tennant also began to increase its market share by purchasing Castex/Nobles and Eagle Floor Care. Castex/Nobles manufactures sweepers and scrubbers for use in a commercial setting; office buildings, supermarkets, retail outlets, airport terminals, hospitals, and schools. Eagle makes a line of propane burnishers to round out the Castex/Nobles line.

Tennant Company, Plant I, Golden Valley, worldwide Headquarters, is located at 701 North Lilac Drive, Minneapolis Minnesota 55422. The mailing address is P.O. Box 1452, Minneapolis Minnesota 55440-1452. The general phone number is (612) 540-1200 and the fax number is (612) 540-1437.

Tennant Company currently employs 2100 people total, world wide, which includes the 950 people in the Minneapolis area. Tennant Company is considered a small company, but in 1996 they had \$344 million in sales.

Plant I is 340,000 square feet, Plant II is 175,300 square feet, Corporate Woods is 60,000 square feet and the New Hope facility is 27,200 square feet. Corporate Woods is where the billing and accounting portions of the business is. New Hope makes the Model 830 machine. Both plants have very serious space issues. Therefore, the space something takes up full and empty must be considered in all changes to be made. Then in my search for transport packaging solutions only collapsible containers will be considered as replacements for current packaging.

The MnTAP supervisor assigned to this project is Fran Kurk. She is a Waste Reduction Specialist assigned to help and guide me. I would like to thank Ken Brown at the Office of Environmental Assistance for the advice he gave me.

I enlisted the help of many people from Tennant Company. Peg Grogan was one of my main supervisors at Tennant. She is a Manager of Environmental Affairs, CHMM. She is also a member of the Pollution Prevention Team. Becky Couet, Facility Maintenance and Engineering Coordinator, was the other supervisor that helped me. She takes an active role in the company by participating in the Source Waste Reduction team. Rick Abarhamson is a Materials Handling Supervisor. He helped me evaluate which parts are currently used and helped me to understand how the warehouse would have to change to accommodate my changes. I decided to involve the purchasing agents that work with various suppliers because they have already developed a relationship with them and they know who needs to be involved in the process. Rick Anderson (Centro), Jane Angell (Applied Power Products), Duane Davis (Flojet, Gorman-Rupp, MET, Ohio Electric, Von Weise Gear and Warner Electric) and Tom Runyon (Imperial Custom Molding) are purchasing agents in charge of various suppliers that I worked with. They helped me meet with these suppliers and come up with solutions to their packaging problems.

PRODUCT INFORMATION

Tennant makes a variety of sweepers. The 6080 model, a walk-behind sweeper, was just introduced in May 1997. It is made mostly of plastic and used mainly for indoor applications. The other sweepers, which are all riders, range in sizes to clean narrow aisles up to large street size sweepers. The 215 is the smallest riding sweeper and is made for tight spaces. The 6400, 355 and 385 are larger machines made for indoor or outdoor. The 385 has extensive rider protection. The 355 and 385 are made on the same production line with alternating runs. The 800 and 810 are made for tough, big jobs, also produced on the same production line. The biggest sweeper made by Tennant is the 830. It is made for street sweeping and is made over at Tennant's New Hope facility.

Tennant also produces an extensive scrubber line. Debris is picked up with a side sweep brush on the front of the machine. Then water and cleaning solution is sprayed on the surface and scrubbed with brushes. Finally, the liquid is collected by a powerful vacuum and a squeegee. They make one walk behind model, the 5700, for light or heavy duty cleaning; depending on the type of brush put on it. The other four models, 515, 530E, 7400, 550/1550 and 8410 are riders with protective frames, if necessary, for indoor or outdoor use. The 530E is a battery powered

machine. They all have brushes for scrubbing and small debris pick-up. However, the 8410 is a sweeper/scrubber to be used to clean large areas. Tennant machines are used to clean factories, warehouses, airport hangers, parking garages and outside areas.

Tennant makes all of the replacement, assembly and specialty brushes at the Maple Grove facility, Plant II; 190,000 brushes annually. Most of the brushes are shipped out to customers or distributors, but about 3% of the brushes come to the Golden Valley facility, Plant I, to be placed on new machines before they go out to customers. These brushes are usually the standard brushes for that machine. Brushes are also sent along, in separate boxes, with the machine when it goes to a customer for a variety of reasons; because it is a special brush, the machine was not purchased until later in its assembly or after completion, or if the brush could be damaged in transit. Tennant also makes specialty brushes for special applications such as very heavy duty, abrasive scrubbing.

The final component to Tennant is the floor coatings. These products treat, repair and upgrade concrete and wood floors. There are high, standard and light traffic systems. They also make products to protect the floor from chemical solvents and battery acid. Products are also available that repair floors that have cracks, chips or holes in them. There are also specialty products for odor sensitive areas. Many of these products are water based and meet all VOC and VOS regulations. These products help the customer keep their property clean and looking nice while meeting all emissions standards.

PROJECT OBJECTIVE

Tennant's vision statement shows upper management supports a project that would help the environment and explains Tennant's request to MnTAP (Minnesota Technical Assistance Program) to help fulfill Tennant's vision statement. Currently, Tennant has a Pollution Prevention group, that includes a Source Waste Reduction team, to reduce the amount of waste coming into Plant I and Plant II. The team is a good group to bring ideas to and to ask support from. The group members come from a variety of areas; maintenance, worker safety and insurance, environmental, shipping and receiving and purchasing. They come in with different knowledge and perspective which helps to better evaluate ideas and work out problems. The team looks at

recycling and sources of waste. However, they wanted to eliminate as much waste as possible from coming in and what can not be eliminated, recycle.

WASTE PRODUCED

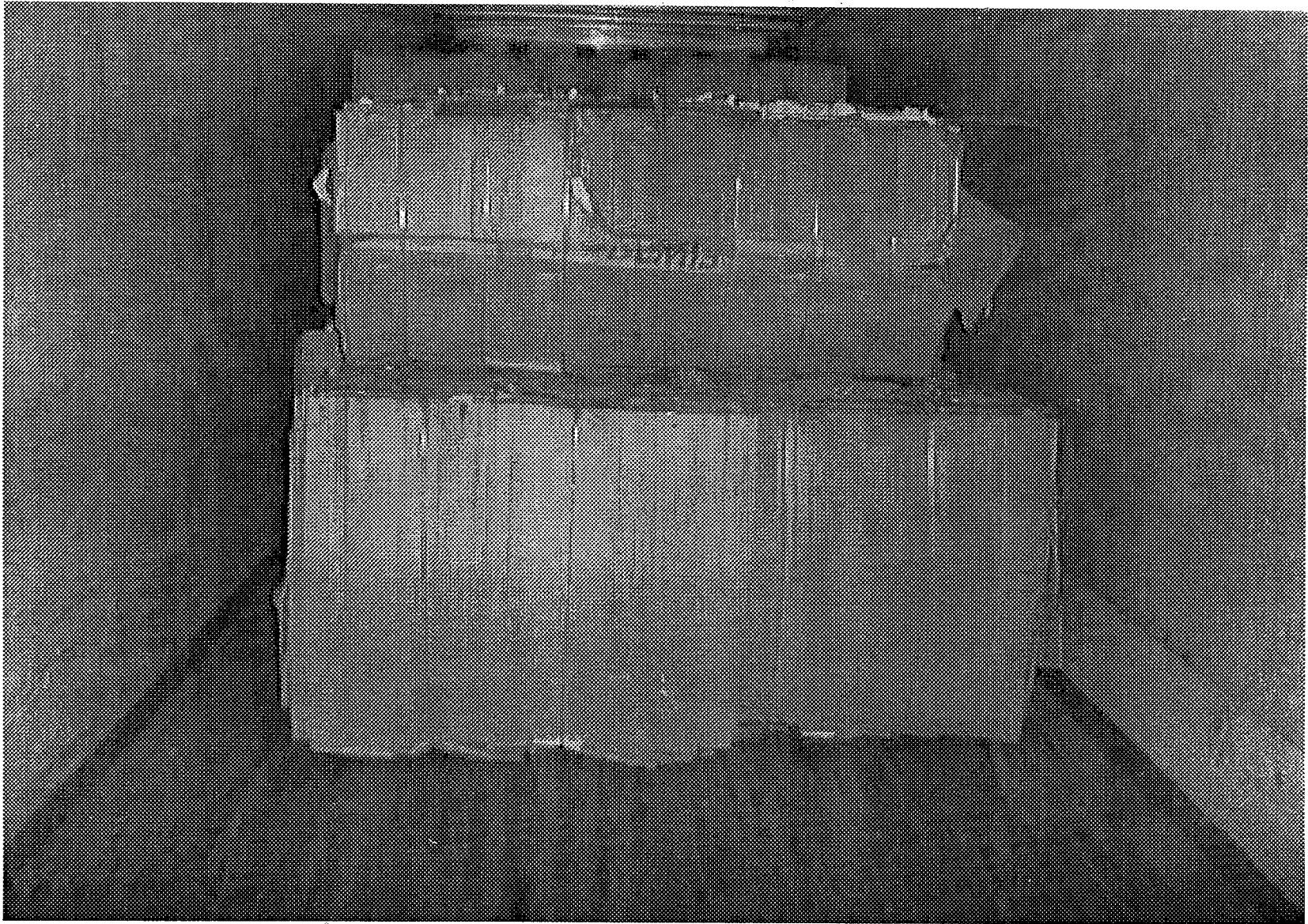
Plant I has many parts going in and out of it each day. There is also a lot of trash and recyclables everywhere. I needed to see what exactly I would be dealing with so I spent one morning with the daytime custodian. She showed me around the plant and around the trash areas. She helped point out the major sources of waste, from largest to smallest quantity, are corrugated cardboard, wood, stretch wrap and plastic bags. All of these sources must be evaluated to eventually reduce the amount of transport packaging entering Tennant.

CARDBOARD

Almost all of the part numbers purchased come into Plant I come in single use, single wall corrugated cardboard boxes. Thermoform, Tuff-Torq and Solar Plastics use cartons that are returnable on a limited number of parts. Thermoform uses double wall boxes with specific inside supports for a limited number of pieces and for a limited number of uses before they are damaged beyond usefulness. Tuff-Torq uses a pallet and sleeve type of packaging. It consists of a plastic top cap and pallet bottom with a triple wall corrugated cardboard sleeve. Pawnee uses cartons that are double wall construction boxes that have a limited lifetime. Pawnee and Solar Plastics use wooden boxes to protect rotational molded plastic for transportation. These boxes are specially made to transport and support store specific to a particular piece or group of pieces, called a kit (i.e. if the part changes new boxes must be made or old ones retro-fitted). They do not collapse and therefore take up valuable rack space when they are empty, they are expensive and are not practical on all lines.

Currently, Tennant bales the corrugated cardboard with other paper, including office paper, and it is recycled by Waldorf, a Rock-Tenn company. A picture of the bales in the trailer is included on the next page. Tennant has one 75 inch baler and two 60 inch balers. The 75 inch baler is emptied daily and the other two, once every two days. Tennant is currently paid \$100 per ton, or the premium cardboard price according to the Official Board Market (OBM) for Chicago, also known as the Yellow Sheet, because of the regular paper that is included in the bales. The price from the OBM usually gives a range. Tennant gets the high end of the range because Rock-

Bales of Corrugated Cardboard From Plants I & II



Tenn can pick up a whole semi-trailer load and take it to a mill. One semi-trailer is taken out of here every 7-10 days and there is an average of 10 tons per semi-trailer.

WOOD

The wood is currently collected in semi-trailers. Tennant averages two trailers every 7-10 days. One trailer has good quality pallets in it, approximately 400 per trailer. These pallets are not used in the warehouses because Tennant has its racks set up to use pallets that are 30"W x 48"L, while the standard industry size is 40"W x 48"L or 42"W x 48"L. The other trailer contains broken pallets, scrap wood and crates or cartons that parts came in. See the next two pages for pictures of the good quality pallets and the scrap wood. Currently, Tennant is working with Pallet Services to take care of the wood. The good quality pallets are taken away for free and probably resold by Pallet Services. The scrap wood is also taken away by Pallet Services to Dunham Brothers to be ground up. Tennant is charged \$150 per trailer.

PLASTIC AND TRASH

Tennant was throwing away their plastic bags and stretch wrap. They are averaging about 200 pounds per week from Plant I. This takes up a large amount of space in the trash compactor and in the landfills. Tennant is charged, on average, \$700 per pick up, or pull, for garbage removal. Plant I averages 2 pulls per month for an average of 15.15 tons of garbage per month YTD (year to date) June. Their goal average for 1997 is 13.5 tons per month. Plant II averages 1 pull per month for an average of 6.86 tons of garbage per month YTD June. However, Plant II did skip a month so that really lowered their average. If that month is excluded, their average is 8.23 tons per month YTD June. Their goal average for 1997 is 6.4 tons per month.

DATA GATHERING

Tennant is committed to source waste reduction but one of the major stumbling blocks was the lack of a complete list of possible candidates for new packaging. Both myself and Tennant needed a place to start so I walked around, with one of the people from Shipping and Receiving, through all of the parts stored in the plant to identify and assess the number, type and amount of part numbers that should be considered for the reusable transport packaging project. He pointed out parts that are used in assembly and those used in service. We decided to focus mainly on the parts used for assembly because they are more likely to be used in bulk quantities. I

Good Quality Used Pallets



Scrap Wood



recorded part numbers, descriptions and manufactures, when available. Then from Tennant's mainframe I was able to obtain approximate yearly quantities and the purchasing agent in charge of each supplier of a purchased product. I made an Excel worksheet that contained all of this information and I sorted this information by Part Number, Quantity, Manufacture and Notes (i.e. which parts would possibly work in a reusable box that had a plastic top and bottom and a corrugated cardboard middle or sleeve). Quantity is important because it focuses on the larger quantities to effectively reduce waste and help with the cost burden of reusable packaging. However, the burden of the cost is not always decided by the quantity of parts, the cost of the current box is also very important. I decided to involve the purchasing agent that works with the various suppliers that I wanted to implement reusable packaging. I think that this is the best approach because the purchasing agents already have developed relationships with people and know who in Tennant and who at the suppliers end needs to be involved. I also hope that when I leave that each of the purchasing agents can be responsible for their portion of the project because this project is so broad that it is too much for one person to continue to coordinate. Peg Grogan can continue to be the point of contact to offer advise and information. I also hope that by exposing the purchasing agents to re-usable packaging they may suggest or implement it again in the future. This will be used to evaluate which suppliers or parts should be considered first and to keep track of parts that may want to be considered in the future.¹

Then, with my list of parts and quantities, I picked out the best places to start. I decided to start with local suppliers and also suppliers that produce motors, pumps, etc. to see if they can use a reusable box similar to one used currently by Tuff-Torq. This box is a pallet and sleeve style box made by Shuert Industries. It has a plastic pallet bottom and a plastic top cap. The sleeve is made of triple wall corrugated cardboard.

PROJECT FOCUS

- **Side Sweep and Tubular Brushes**
 - Very Visible Source of Waste
 - Initially Seemed Relatively Easy
 - Something Similar Was Done in the Past

¹ See Appendix A for the complete list of the parts and sorted in various ways

- **Imperial Custom Molding: Plastic Parts Supplier**
 - Expressed Interest in the Past to the Purchasing Agent
 - Local Supplier
- **Centro, Pawnee, Applied Power Products, Flojet, Gorman-Rupp, MET, Ohio Electric, Von Weise Gear and Warner Electric**
 - Large Volume of Waste
 - Current Packaging Expensive
 - Relatively Easy Off-The-Shelf Product as the Solution
 - Applied Power Products, Pawnee and MET are Local Suppliers
- **Parker**
 - Local Factory
 - Many Part Numbers Purchased
 - Large Waste Volume
- **Recycling**
 - Should be Implemented Along With Elimination

SPOOL UNITS AND BOXES FOR BRUSHES

As I walked around the plant and talked to people working on the plant floor I asked them where they saw large amounts of waste and the number one answer I received was the brush boxes for the brushes that go on the machines that come from Plant II.² I decided that this should be one of my areas of focus. However, Tennant makes 190,000 brushes annually, but only about 3% of them (5,400 brushes) come to Plant I to go on machines. The small percentage makes change difficult because of the low economic payback. About half of those brushes are side sweep brushes and the other half are tubular sweep brushes. On average \$1.50 is being spent on the packaging of the 5,400 brushes being considered for having their packaging replaced by reusable packaging. This equals to a total of \$9,100 is spent annually on the brush boxes that are being considered for replacement.³ There are three side sweep brushes⁴ (2,790 brushes) and 12 tubular brushes⁵ (2,600 brushes) that are being considered for reusable packaging because they have high volumes to justify the use of reusable packaging. In considering the options for reusable packaging of the identified 5,400 boxes, several ideas were discussed. The ideas included:

- Re-design existing boxes to be stapleless and re-closeable for all brushes

² See Appendix B for a picture

³ See Appendix B for a complete list and price breakdown

⁴ See Appendix B a picture

⁵ See Appendix B for a picture of tubular brushes and boxes

- Re-usable metal spool units for the side brushes
- Pull staples from existing boxes and re-use for tubular brushes

Re-usable packaging for the assembly brushes would require some way to differentiate, when ordering, if the order was for service, to be put in to a single use box, or for assembly, to be put in re-usable packaging. Creating two part numbers is the one way to insure things would never get mixed up. However, this caused problems because a new part number would have to be created and people would have to be retrained to use the new number. If two part numbers are created the new one would be used for assembly and the old one for service because customers have the replacement part numbers in their manuals that they use to order from. It would be extremely difficult and impractical to issue new part numbers for service parts. Another option is to use a comment box on the order form that would say that these brushes should be placed on the re-usable packaging. This would be easier because two part numbers would not be necessary. However, this does require the people ordering the brushes to remember to write it on the sheet in the correct place. This was suggested by Jeff Haynes.

New re-closeable boxes with a die cut top were considered because it would not require any change to the current system. The assembly person would simply open the box, take the brush out, flatten the box and it would be sent back to Plant II to be re-filled. It would be very unlikely that a particular box would ever end up at Plant I twice, therefor they would not wear out. However, when I talked to a representative at Stone Container in St. Paul, David Halper, he said it would cost 20-30% more per box. This would not be cost effective because only 5,400 boxes would ever be used twice. I realized that different options would be necessary for the different brush types; side sweep and tubular.

SIDE SWEEP BRUSHES

I decided to tackle the side sweep brushes first because there are only two part numbers being considered and they are both very high volume. These boxes are usually more expensive than the tubular brush boxes because they have three parts to keep the brushes safe. In the past, about 15 to 20 years ago, a spool type device, made out of wood, was used to transport side sweep brushes from Plant II to Plant I. Therefor I decided to try to do this again with some modifications.

I designed a pallet with two spools on it for the side sweep brushes. The unit is made completely of metal. The pallet is 30"W x 56"L with 2 metal spools attached to the base, solid sheet of metal, during use, and a total of 37" long, but are removable when empty. It also has a stopper that is 3" in diameter and 10" above the top of the pallet.⁶ There is a compartment in the center support of the pallet that will hold the spools for transportation when the unit is empty. See the drawing below.

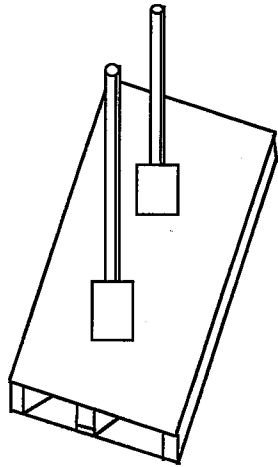


Figure 1: The spool units to be implemented

The spool units will be made by an outside company because it would take up too much valuable Tennant product time to make them in house. The company I decided to work with, Du Fresne Manufacturing, is one that Tennant currently contracts work out to when the in house welding shop is too far behind. The quote from Du Fresne is \$174.49 (\$70 for materials, \$60 for welding labor(1-3/4 hours.) and the balance for other labor associated with the process) per unit for about 50 units. This leads to a capital investment of \$8,725. Currently, Tennant spends \$5,800/year on these brush boxes. Therefore, the return on the investment would take 1.51 years. I think that the individual price sounds reasonable, considering the break down of costs, and the 1.51 years to return the capital investment is reasonable. These pallet units are constructed of metal so that they will last an indefinite amount of time. The units have not been purchased as yet. They would eliminate the need for Tennant to buy **4.56 tons of cardboard annually**.

Two brushes will be considered to have boxes replaced with spool units for assembly. They are Tennant part number 59431 (1,045 brushes annually) and part number 80042 (projected

⁶ See notes 7/11 & 8/5/97 for design

at least 700 brushes this year). Part number 80042 is specifically for the 6080, a new machine, therefore it is assumed that more brushes will be needed next year, an estimated 35 per week or 1,600 annually. 50 spool units will be needed to effectively fulfill the cycle time, number of brushes and different lines that use these brushes.⁷

It is also important whether or not the spool unit will take up more room than is currently allocated. The spool units will take up one pallet size of floor space and be 41" from the ground to the top of the spool. Currently the brushes are stacked in two columns up to 90" tall after they are taken off a wider pallet (48"W x 48"L).

Concern was expressed about the possibility of brush damage. Tennant used spool units in the past to transport brushes to Plant I so there should not be any damage. They discontinued this practice because reusability was not very important to the company at that time, but the company vision has now changed. Currently, the 355/385 production line stores their brushes on a similar structure for use during production without any damage. A picture of this unit is on the next page.

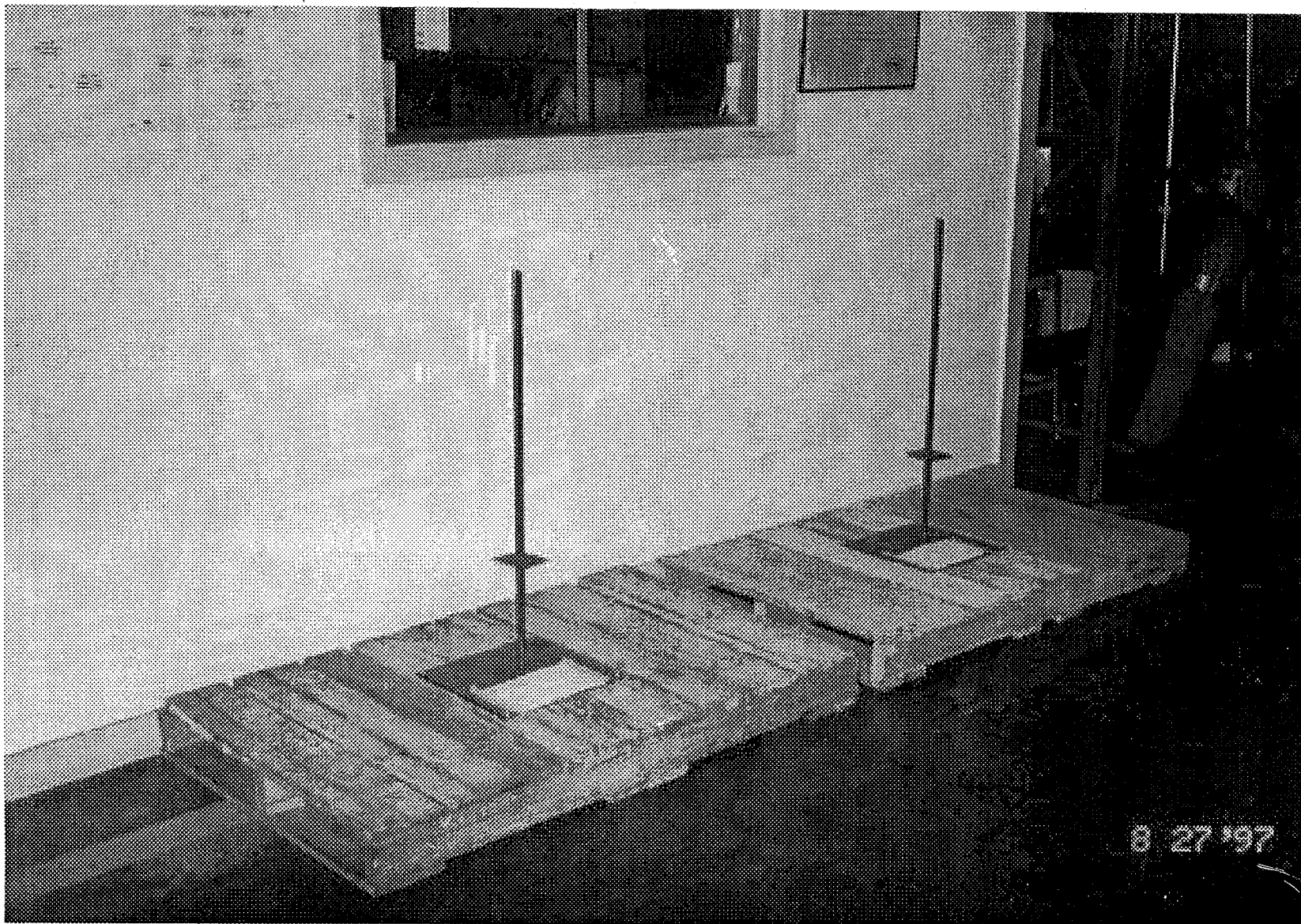
A pilot study is going to be run to insure that the brushes will not be damaged in transport and that the people on the assembly lines will be able to work with them effectively. The brushes were ordered by me and Jeff Haynes will take the brushes out of the boxes, put them on the spool units and send them to Plant I. This test will help eliminate the major fear that the brushes will be damaged. The prototype is similar to the real design, but there is only one spool per pallet. The rod, stopper and base were welded by the Tennant maintenance department and bolted to a standard Tennant pallet. A picture of the actual prototypes is on the next page, also see the drawing below.

⁷ See notes 7/23, 7/28 & Appendix B, brush report

Temporary Brush Holder Used On 355/385 Line



Prototype Spools



Prototype Spool



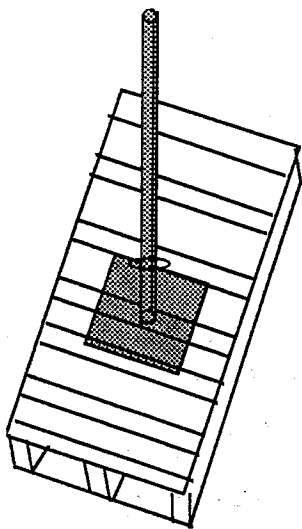


Figure 2: The prototype spool unit design.

The pilot test went well. The brushes were not damaged in the truck ride from Plant II to Plant I. However, because the diameter of the spool is so small, 1/2 inch, and the hole the brush, part number 59431, is 2-1/2 inches the brushes tend to slip and not stack straight. This may cause a problem after 3 weeks of storage. I considered three options to fix this. They included:

- Special metal spool for each brush
- An adapter to increase the diameter of the spool to hold the brushes in place
- A spacer in between each brush so they do not rest on each other

A special spool for each type of brush is too complicated. It would be difficult for the people putting the brushes on the spool units. They would be more likely to get lost because they would not be able to stay in the bottom compartment until re-use. I also wanted all of the units to be the same to lower cost per unit.

Therefore, I contacted Quality Paper Tubing for a quote on a paper tube to use as an adapter. The tube would be 2" in diameter, 27" long and have a 1/4" thick wall. The tube would look similar to a tube that bulk wrapping paper is purchased on, but the adapter has much thicker walls. Quality Paper Tubing quote was 100 tubes at \$1 each, 250 tubes at \$0.64 each and 500 tubes at \$0.52 each.⁸ These tubes could be re-used or recycled after one use if they were lost. They have a lead time of one week. I tried this out with a piece of tubing from the shipping department. The tube did eliminate the slipping. However, the bristles still rest on the brush back of the next brush. This causes the bristles to be damaged after sitting for a period of time.

⁸ See notes 9/4/97

The third option is to take small pieces of tubing 3" in diameter and 2" tall and place them between each brush. This will raise each brush so that it is not resting on the brush back of the next lower brush. The spacers would be relatively cheap and easy to use. Quality Paper Tubing could be contacted to make these also. This modification would be easy to use and would cause no brush damage.

TUBULAR BRUSHES

The tubular brushes pose a greater problem because there are 12 different brushes of various sizes that would be considered for reusable packaging.⁹ There are two main groups of brushes, ones that are less than or equal to 48" long and those that are 51" long. I, along with some help from the shipping manager and the safety engineer, designed metal racks that could be used for the first group of tubular brushes. The second group is too long for the rack so they could go in re-usable double walled boxes.

I came up with the idea of putting the smaller tubular brushes on racks from a rack that I found in the final test area of Plant I. Final test had one rack made to hold brushes that are used to test the machines before they are shipped to customers. I have included a picture of this on the next page, it is similar to the one I designed and describe below.

The rack that I designed for the smaller tubular brushes is, without casters, 49"L x 30.5"W x 57.5"H. There would be racks at 11.5", 19", 23", 34.5", 38", 46" and 57.5". Then on each rack there would be slots at 1", 5", 10.5", 12.5", 20", 25" and 29.5". The brushes would be suspended by rods that went through the brushes and rested in the slots. The rack would hold 20 of the 9" diameter brushes, 15 of the 12" diameter brushes and 6 of the 17" diameter brushes. The frame around the rack to protect the brushes if the racks bump into each other was, without casters, 58"L x 37.5"W x 62"H.¹⁰

The head of the brush production department did not like the idea behind the racks, for the tubular brushes, because they are not collapsible and would take up too much room when they are empty. Therefore I would recommend using re-usable corrugated boxes for all of the tubular brushes. I have been working with Shuert Industries, Longview Fiber Company and Stone Container as possible suppliers. These containers could be corrugated plastic or cardboard.

⁹ See Appendix B for a complete list and price breakdown

¹⁰ See notes 7/11/97

Concept Rack For Tubular Brushes



Corrugated plastic may be a better choice in this case because between Plant I and Plant II is a closed loop. 70 units would be needed and corrugated plastic would last longer than corrugated cardboard. However, corrugated plastic will be more expensive. Convoy Container makes a cap and sleeve corrugated plastic box that would work well for this application. A corrugated plastic box will last about 3 years. I received a sample corrugated cardboard box from Stone Container but any cardboard manufacturer could make a box similar to this. A corrugated cardboard box will withstand about 12 cycles. The amount spent on boxes for the tubular brushes is \$3,300 annually. This aspect is something that should be pursued in the future after determining how well the closed shipping loop works with the side sweep brushes on the spool units because it would eliminate the need for Tennant to buy **1.21 tons of cardboard annually**.

A temporary solution that could be implemented is pulling the staples out of the tubular brush boxes at Plant I, on the lines, and returning the boxes to Plant II. Sorting would be done at Plant I to insure that the boxes from a specific line stay together. Someone at Plant II would have to cover the part number stamp and return the box to the correct place in storage to be used again. 3M makes a product called *Box Re-New* that would cover the printing on the box and it would still look nice. This option involves extra work, but it could be spread out over many people. This was discussed with the brush department manager and he did not like the idea because it could damage the box and with the paint on it, the box will not look very professional when it is sent out to customers.

RECOMMENDATIONS FOR THE SIDE SWEEP & TUBULAR BRUSHES

- Finish trial runs of prototype spool unit
- If brushes remain in good condition:
 - Purchase & implement spool units from Du Fresne Manufacturing
 - Purchase & implement spacers for brushes
- Explore use of comment box to route filling of re-usable packaging with brushes
- Do not pull staples from tubular boxes
- Use re-usable corrugated cardboard/plastic box with a split sleeve for tubular brushes

TOTES

I investigated the use of plastic, stackable and collapsible totes for the transport of parts from Imperial Custom Molding, refereed to as Imperial. Imperial has made injection molded plastic parts for Tennant for many, many years. Currently, they make 212 parts that go into Tennant machines making Imperial a good candidate to introduce the use of re-usable transport packaging. I worked with Tom Runyon, the purchasing agent at Tennant responsible for the Imperial account, on contacting and discussing options with them. I decided that a plastic tote would fulfill the need best.

Before I decided what design of tote would be the best I talked with the shipping/receiving people and the person that keeps track of the inventory in the warehouse. Imperial currently delivers 1330 boxes annually; 191-10", 162-12", 68-14", 359-16", 214-18" and 336-20", square boxes.¹¹ The cost of these boxes range from \$1-2, for a total of \$1,800 annually.¹²

The current boxes used by Imperial do not fit well on the standard Tennant pallet, 48"L x 30"W. Therefore, I choose a box that would meet Imperial's needs but would still work well for Tennant.

There are two suppliers that are being considered for the re-usable totes for Imperial parts: Schaefer Systems and Orbis. The price difference between the two suppliers is significant. Schaefer Systems quoted \$47.25¹³ for a container that is 23.7"L x 15.8"W x 12.6" H, externally and collapses to 3" high. This is a very nice tote. It is made of a high gage plastic. The piece along the width of the box folds in. However, the releases for the sides of the box, so that it will fold up, are made of plastic and could break in the future. It is also possible to totally remove this piece, so it could become separated from the rest of the tote.

There were two styles being considered from Orbis; one is very similar to the Schaefer container it is 24"L x 15"W x 14.7"H and collapses to 3.5" high but the cost is only \$24.49.¹⁴ This container does not have plastic releases like the Schaefer tote. The width piece is hit into place and then pressed in the bottom corners, from the outside, to fold it up. I think this is a better design because there are less pieces to break and there are not any pieces that could be

¹¹ See Appendix C for a picture of a stack of Imperial boxes

¹² See Appendix C for a complete list of Imperial parts and quantities

¹³ See Appendix H for the quote

¹⁴ See Appendix H for the quote

separated from the rest of the tote. I have included a picture of the tote fully assembled and fully collapsed on the next two pages.

The second container from Orbis is very similar to the other two and is quoted at \$21.55 each. It is 24"L x 15"W x 16.3"H. However, only the top portion collapses so that when collapsed it is about half of its original height (7.2" high).

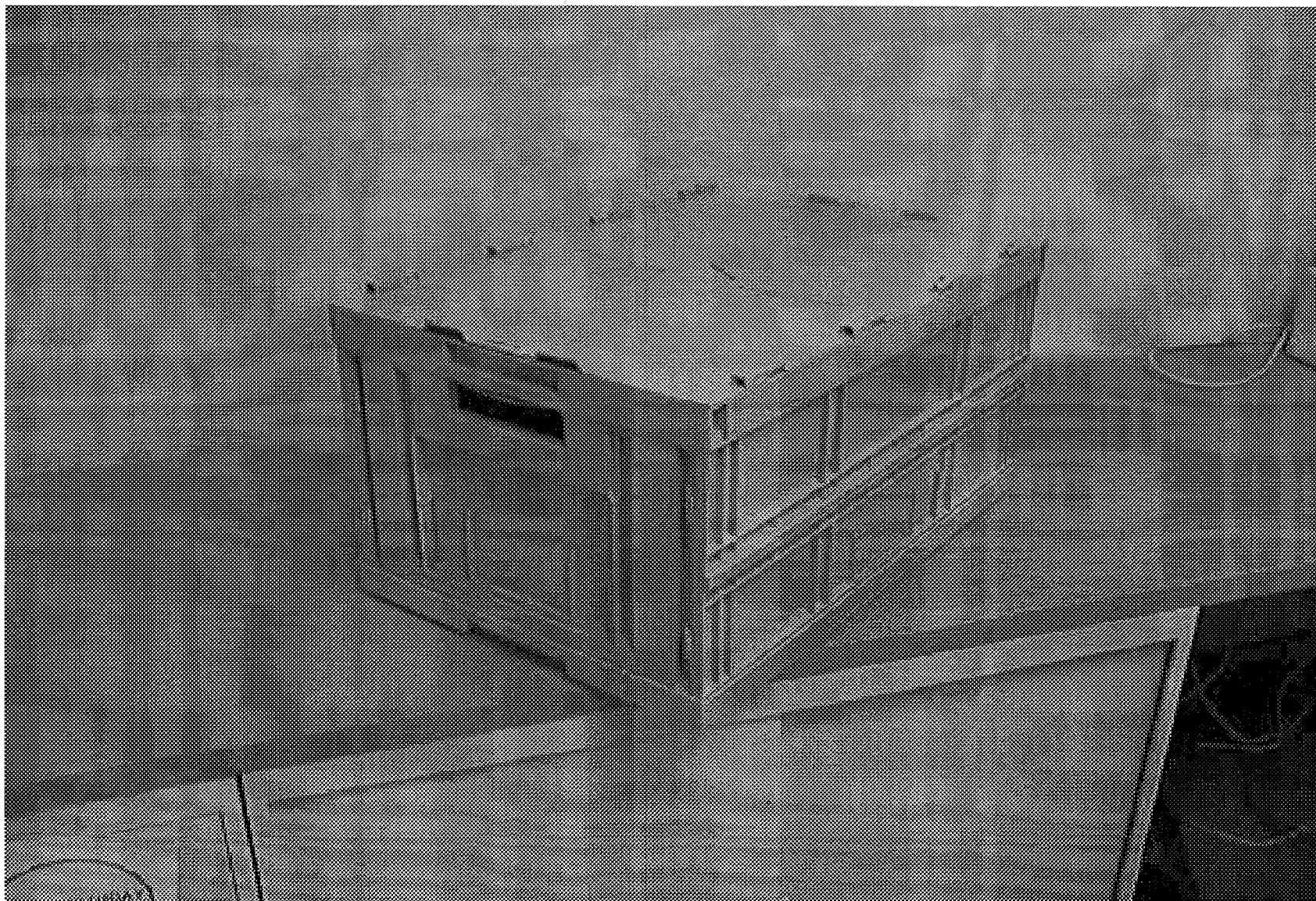
One option that was also considered was to put the 4 smaller box sizes into the tote and buy reusable 20"x20"x20" boxes. I have contacted Longview Fiber for a quote on this but it was too high; \$5.07 per box for approximately 12 cycles.

The extra storage space in the bottom of the container from Orbis that only collapses half way would not be necessary. Two samples from Schaefer Systems were obtained. One of them went to Imperial so that they could work on the dunnage problem. The other one is still in my possession. It will stay with this report and be used in the future to evaluate the feasibility of this type of product. I also received a sample from Orbis of the tote that collapses all the way down. I gave this one to Tom Runyon to review and discuss with Imperial. The cost of the totes is significant compared to the cost of the current boxes. However, there would be a great reduction in the amount of cardboard being used, **0.97 tons annually**. The Schaefer totes are too expensive, but they are nice. The two from Orbis are more reasonable priced. I think that Tennant will go with the one that collapses down all the way, to save space.

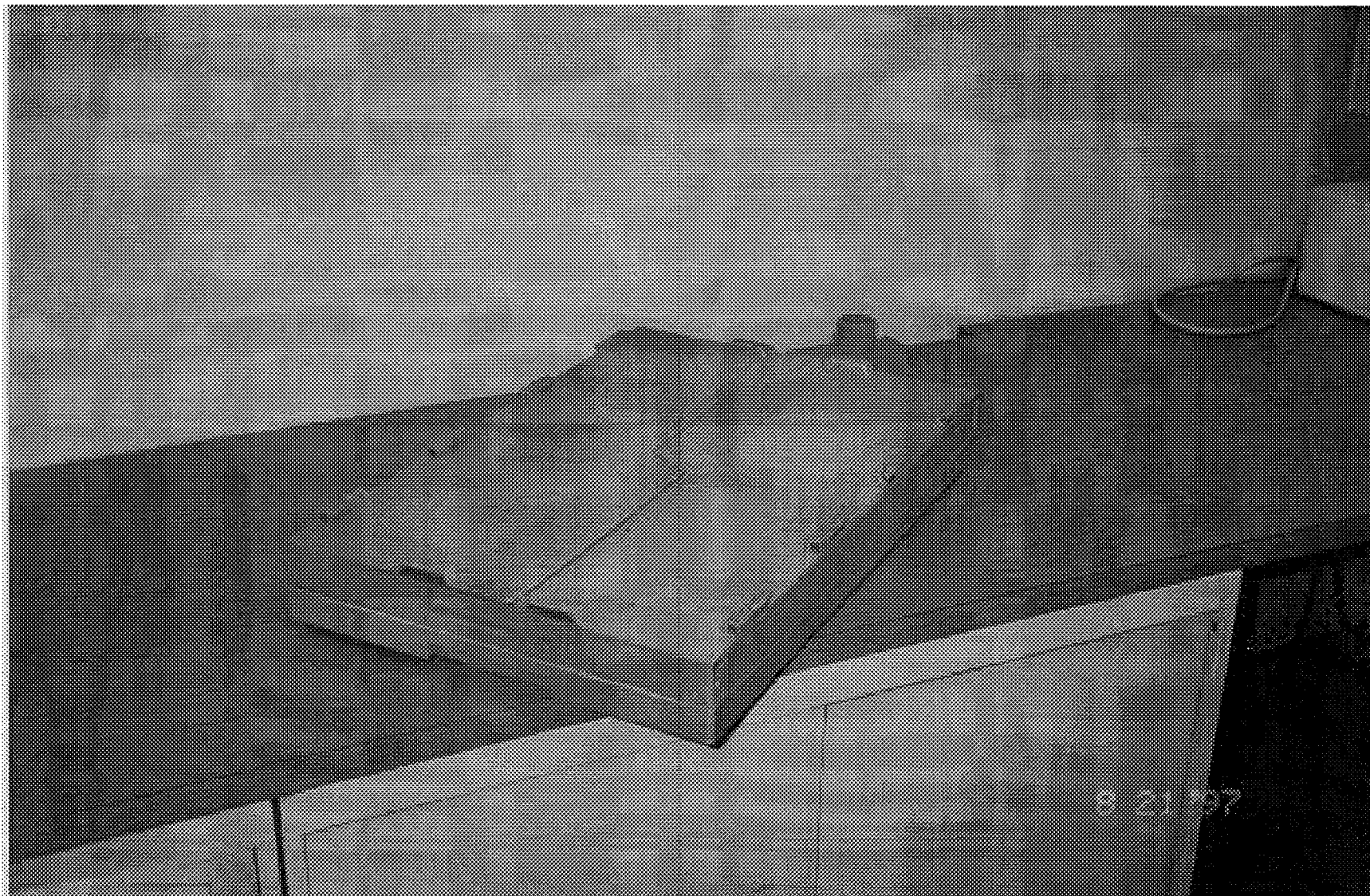
In order to fit all of the parts that currently go into 6 different size would go into the Orbis tote that collapses to 3.5" high. It has outer dimensions of 24"L x 15"W x 14.7"H and 22.5"L x 13.6"W x 13.7"H as internal, usable dimensions. These totes would fit perfectly on a Tennant pallet; 4 per layer (2 x 2) and 3 layers high. They would also have to consider sending totes not full or Tennant would have to order the parts less often for two reasons. One, some part sizes are small allowing for more than needed quantities at one order point. Second, other parts are very expensive so Tennant does not want to purchase a large amount at one time. Using dividers or cardboard layers within the totes helps to stabilize these types of parts and helps to prevent excess movement in transportation. This is important to both Tennant and Imperial to assure that parts are not damaged due to less than full totes.

The next phase was to determine what parts to consider for use in the totes and how many would be needed to provide the transportation of each part. Imperial provided me with a list of

Plastic Tote Being Considered For Imperial Custom Molding



Plastic Tote Collapsed For Imperial Custom Molding



all of the parts that they had sent to Tennant from June 1996 to June 1997. This was very helpful because I could then quantitatively choose which parts they should put in the totes for transport and which should not. This decision process was determined by reviewing the shipments of parts from Imperial and calculating the number of boxes used per purchased part per year that come into Tennant. Then I took the current box size for each part, number of current boxes and the new tote size and calculated how many current boxes could go into the new one. I then decided to only include parts that would return at least 1 tote to the system each month. This narrows the field down to 16 parts. The 16 parts are delivered in about 103 boxes per month.¹⁵ Then I multiplied this by 3.5 to account for the short return trip, parts in Tennant's warehouse, totes being filled at Imperial and empty totes. A minimum of 360 totes should be purchased. However, to accommodate future growth I am recommending that at least 400 totes should be purchased in this order. I did write up a complete economic analysis, but I will not include this here.¹⁶

The totes would be purchased by Tennant and then the piece price from Imperial should go down because they will no longer be charging us for the boxes. Imperial needs to address the problems with dunnage in relation to going to one box size to replace 6 sizes. One option discussed is to try this with a select number of parts. However, there is concern that purchasing fewer totes at one time would increase the price.

Another issue is keeping track of the totes. They could be numbered with a hot stamp or labels and there could be a quarterly counting to see if they are all still present. It has been decided that only Tennant personnel will remove a tote from the system in the case of damage, because the totes are owned by Tennant.

The totes could be delivered in installments of 100 over a period of 40 days, so that they can be phased in and no one has to store a large number of totes until they can be used. However, if Tennant wants to number them then they should all be delivered at once and both suppliers can keep some in storage until they are needed.

Then there is also the cost to return the empty totes. Tennant will pay for the return cost, and will return them every 10 calendar days. One van trip costs \$30.

¹⁵ See notes 8/8 & 8/11/97

¹⁶ See Appendix C

Imperial also delivers some parts in large gaylord boxes. They may also be interested, in the future, in looking at some pallet and sleeve style boxes of corrugated plastic, 48"L x 30"W x 40"H. This should be followed up on by Tom Runyon.

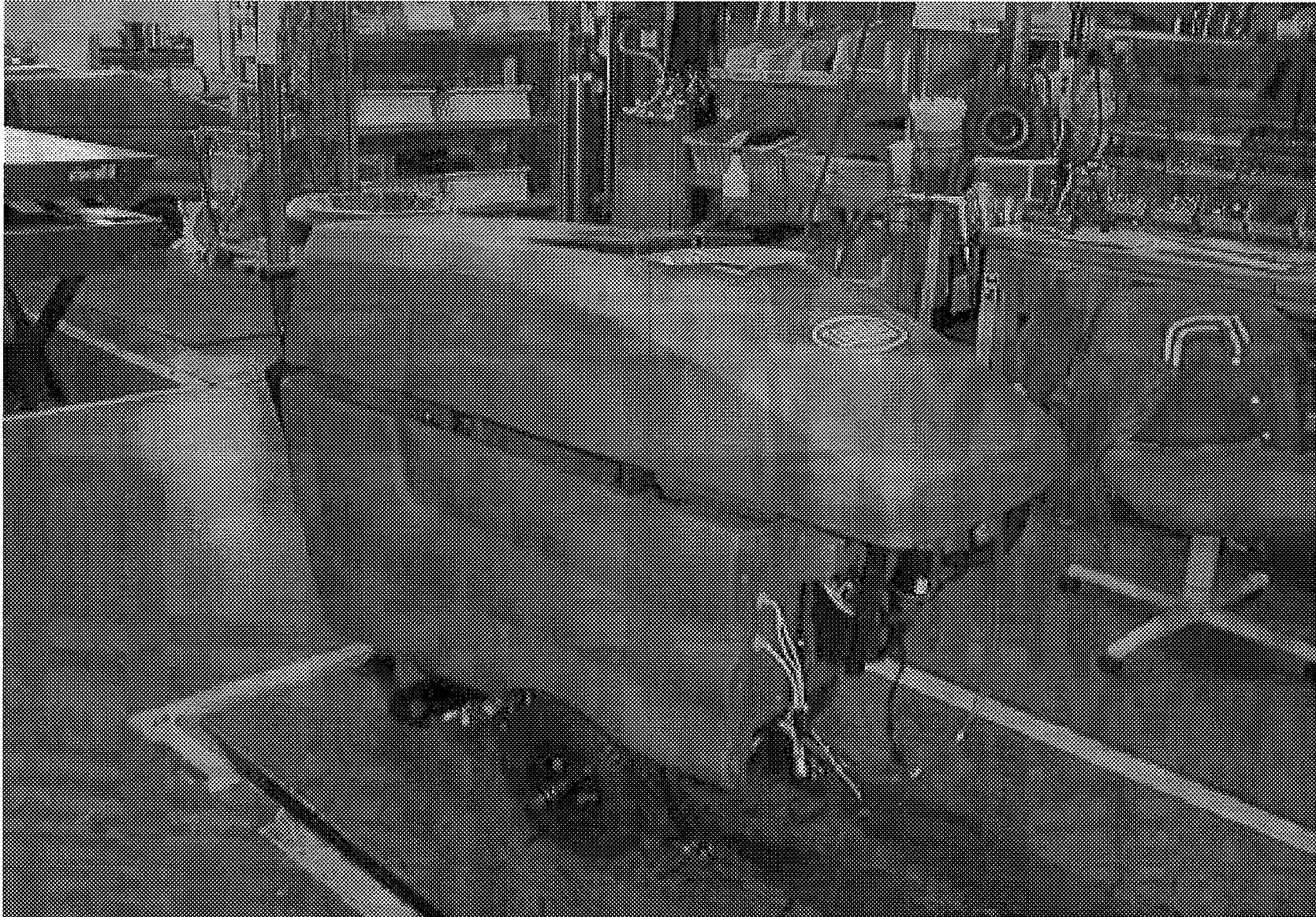
RECOMMENDATIONS FOR THE TOTES FOR IMPERIAL CUSTOM MOLDING

- Issues to resolve
 - Whom will pay for the totes
 - Storage Space
 - Fire Protection because of the concentration of plastic in one area
- Purchase 400 totally collapsible totes from Obis
 - Label totes with Tennant and Imperial logos
 - Phase in if necessary

PLASTIC PALLET AND SLEEVE BOXES

Centro is a supplier in Iowa that makes rotational molded plastic pieces. I worked with Rick Anderson, the purchasing agent at Tennant responsible for Centro, on contacting and discussing options with Centro. Currently, they make the tank kits for the 5700 machine. I had heard about these tanks as soon as I arrived at Tennant because of the large amount of waste produced. The tanks are a class A surface, which means that Tennant needs to be kept it looking nice because it is on the outside and the first thing a customer sees when the product is delivered. Currently, Centro sends Tennant 75 tank kits per week, or 3,600 annually, in one use boxes with a total package cost of \$10.12 per tank kit, or about \$36,400 annually. The current transport packaging for the kit includes a box, a plastic bag and a piece of hard foam. The current box that the Centro tank kit is shipped in is too small for it. The current box is 50"L x 34"W x 35"H and the tank is 52" long. The picture on the next page shows the current box being used. Tennant had already realized this and was working on purchasing reusable corrugated cardboard boxes that have a 3 cycle life time. The cost for the returnable cardboard boxes is at \$24 per box unit or \$28,800 annually.

Part Number 222585: Model 5700 Tank Kit by Centro



Current Box For The 5700 Tank Kit



Fortunately, I was able to talk to the purchasing agent responsible for Centro, Rick Anderson, before the new boxes were implemented. I told him about a product that uses a plastic pallet as the top and bottom of the box and a corrugated cardboard or plastic sleeve in the middle. The plastic pallet bottom eliminates the need for a separate wooden pallet. This tank group is an odd shape to find off the shelf packaging for. After many telephone calls I was able to find a pallet size that would fit our needs. Orbis manufactures a pallet that is 55"L x 35"W on the outside and 53" L x 33" on the inside. Then I choose a sleeve height of 40". The page after next shows a similar box that is currently used by Tuff-Torq.

The tops and bottoms of the Orbis box should last at least 10 years, if not longer. The sleeves should last 35 cycles. The boxes will be returned to Centro to be re-filled once a week at a cost of about \$175. 400 units would be purchased and no extra sleeves at this time so that they do not have to be stored until use. The pallets, interchangeable as top and bottom, are \$42.25 each and the sleeves are \$13.85 each, for a total of \$98.35 each complete box.¹⁷ If the Orbis boxes are purchased Tennant would **save \$27,300 annually**, after the initial year, this includes paying for return shipment once a week. These plastic pallets and sleeves could be used for the next generation of the Model 5700 or another product after the current Model 5700 lifetime is over.

This new packaging will not require the foam piece because the top will be hard and will not cave in, like the old box, when they are stacked on top of each other. However, the plastic bag will still be required to prevent the piece from chafing on the cardboard.

A corrugated plastic was also considered in place of the corrugated cardboard. However, even though the corrugated cardboard could be used less times it was still more cost effective.

PAWNEE

Pawnee, located in the Minneapolis area and a Tennant truck goes to the plant and picks up the rotational molded plastic frame kits for Tennant's Model 6080. Currently, the frame kit is transported in a double walled box with dimensions: 34"W x 58"L x 34"H. These boxes are returned to Pawnee. However, Tennant is charged \$16 per box for a new box each time a part is ordered because when the piece price was negotiated the boxes were intended for single use. This is a significant cost.

¹⁷ See Appendix H for the quote

Part Number 80308: Model 6080 Frame Kit by Pawnee



However it was found that the Orbis box that is being considered for the Model 5700 for Centro could also be used for the frame kit from Pawnee. Two frame kits for the Model 6080 could fit in the new box. Therefore, Tennant would save \$32 on packaging per frame kit. This would **save Tennant \$26,800 annually.**

70 units would need to be purchased to insure that the shipping loop of boxes would run smoothly. This is such a low number because currently, a Tennant truck goes to Pawnee empty and picks up the orders 3 to 4 times a week. Therefore, re-usable boxes could be shipped back very often. Pawnee would also receive 25 extra sleeves at the time of purchase to cover any lost or damaged sleeves in the future.

CENTRO & PAWNEE

To accommodate the transportation of the two parts from both Centro and Pawnee to Tennant 940 pallets and 940 sleeves would be purchased. **The initial capital investment, would be \$43,800.** There would be a **payback time of 0.69 years.** After the initial payback period **the total yearly savings would be \$54,200 annually.** More sleeves would need to be purchased at some time to maintain the system. Orbis may require that a minimum of 150 be purchased at a time. Ordering less than that is very expensive. There also needs to be a card holder attached to the sleeve so that the part inside the box can be identified without damaging the sleeves or defacing the pallets. By implementing these boxes **32 tons of cardboard and 52.8 tons of wood will not come into Tennant Company annually.** A full report on the packaging being considered for Centro and Pawnee is in Appendix D.

RECOMMENDATIONS FOR PALLET & SLEEVE BOXES FOR CENTRO & PAWNEE

- Line supervisors are ready to go ahead with project
- Investigate placards for labels for sleeves
- Design art work for sleeves
- Write up paper work necessary to purchase boxes
- Order boxes & placards
- Lead time is 3-4 weeks

WOVEN POLYPROPYLENE BAGS

Plastic bags are frequently used as a component of transport packaging mainly to protect parts during transit. The tanks coming in from Centro currently come in a box with the part inside a transparent garbage style bags, 6' in diameter and 6.5' long, are currently used to prevent the cardboard from chafing the plastic. Currently, 0.56 tons of plastic is generated each year by these bags. I contacted Mike Maguire from MDM Packaging about the possibility of using re-usable bags. He was able to obtain a sample for me from Unidex. These bags are made of woven polypropylene and have liners in them to prevent any chafing of plastic parts. If bags were purchased they may not be the same size as the current plastic bags because they would be purchased from stock. It may be necessary to purchase two bags for each box to adequately cover the part. However, they would eliminate 0.56 tons of plastic from coming into Tennant each year. The re-usable bags cost about \$20 and could be purchased through Mike Maguire.

REUSABLE PALLET & SLEEVE BOXES FOR: FLOJET, GORMAN-RUPP, MET, OHIO ELECTRIC, VON WEISE & WARNER

Flojet Corporation, Gorman-Rupp Industries, Minnesota Electric Technologies (MET), Ohio Electric, Von Weise Gear and Warner Electric all have Duane Davis as their purchasing agent. All 6 produce similar sized pumps, actuators, shakers and motors. Individually, these 6 suppliers use a relatively small volume of boxes. However, combined they used a significant number of boxes to consider purchasing re-usable transport packaging to transport parts to Tennant. Duane Davis and I decided to try and combine these 6 suppliers and have Tennant purchase one size box with various types of inside support for each product style.

I measured all of the current box and part sizes. Then I correlated them and decided that a box that is approximately 30"W x 48"L x 33"H would work well. I have decided that a pallet and sleeve type of package would work the best. They will be similar to the product being used for Centro and Pawnee. Once the approximate reusable box dimensions were defined, I investigated suppliers the size of standard packaging that would be available in this range.

I then used this size to figure out how many boxes would be required, taking into account the size of the previous box, the size of order normally placed, the cost of the part and the annual usage, I calculated that 243 units would be required to keep the cycle moving smoothly. I have

included a complete report showing how all of these numbers were calculated in Appendix E. I assumed the boxes would be returned every 3 weeks to each company. The boxes would be divided between the suppliers in the following manner:

- Flojet = 20
- Gorman-Rupp = 63
- MET = 16
- Ohio Electric = 45
- Von Weise = 72
- Warner = 27

I would also order 57 extra sleeves with a fraction, equal to the fraction of units they are getting, going to each supplier:

- Flojet = 5
- Gorman-Rupp = 15
- MET = 4
- Ohio Electric = 11
- Von Weise = 17
- Warner = 6

This would eliminate the need for storage at Tennant and would divide up the amount of storage between many places and not putting anyone in a storage pinch.

Packaging Solutions, a disturber of transport packaging for Shuert Industries provided pricing for a box with outer dimension of 47-1/4"L x 31-1/2"W x 42"H and internal dimensions of 44-3/8"L x 28-3/4"W x 33"H. ¹⁸ I have included on the next page an example of the boxes being considered that is currently being used by Tuff-Torq. The sleeves would be \$24.46 each, the lid is \$25.50 each and the pallet bottom is \$37.82 each, for a unit price of \$87.78. If all six suppliers participates, the initial capital investment would be \$22,700. This would require a payback time of approximately 0.70 years, based on how much one supplier currently spends on packaging, but it will vary from supplier to supplier. The implementation of this would **eliminate 3.01 tons of cardboard and 6.38 tons of wood from coming into Tennant each year.**

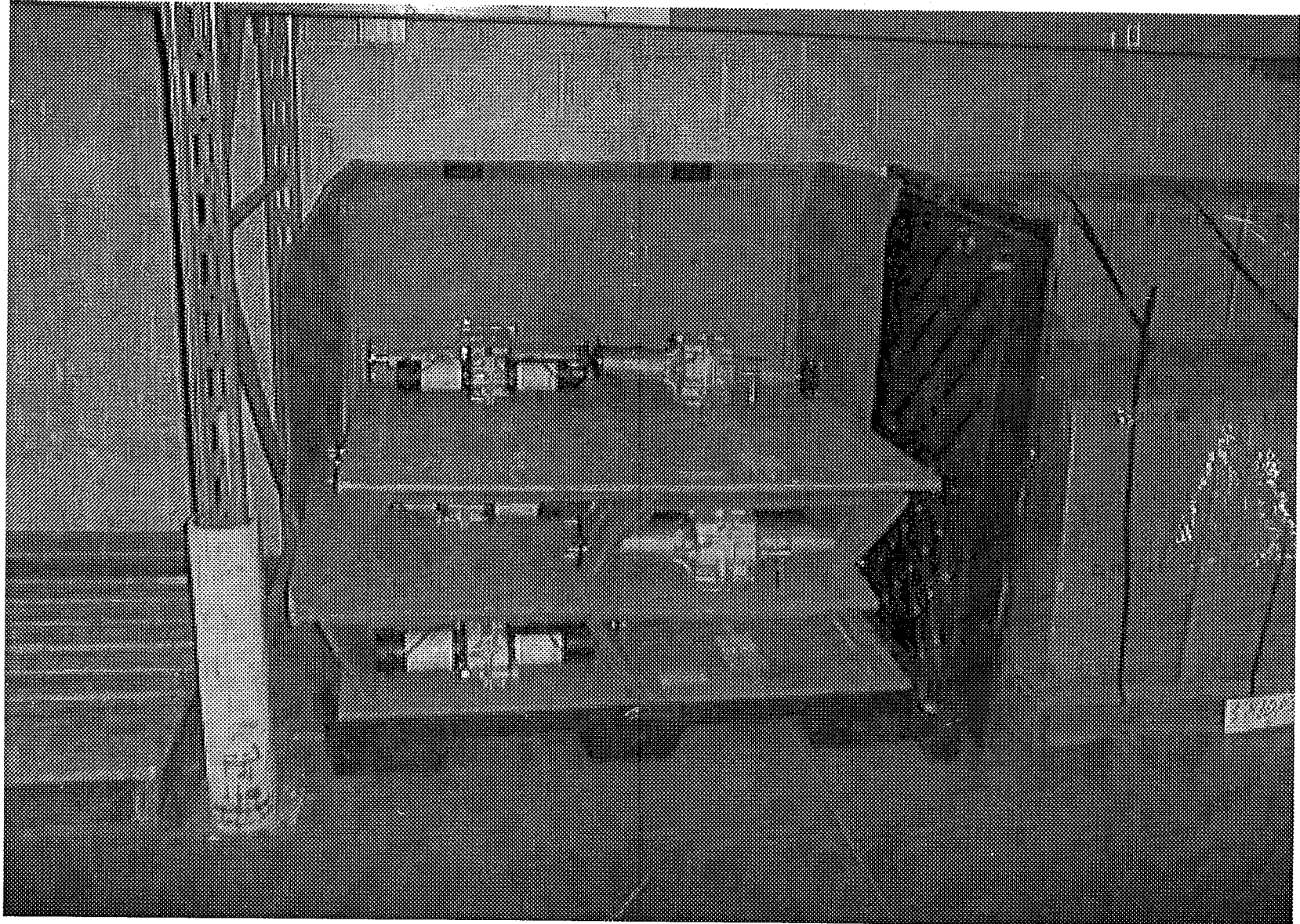
Duane Davis and I discussed the issue of internal packaging and the needs of the 6 suppliers. Also, they each have current suppliers with their current specifications. A picture of an example of internal packaging that is used by Tuff-Torq is on the page after next. Therefore, Duane Davis and I decided that we would present the possibility to each supplier be responsible

¹⁸ See Appendix H for the quote

Tuff-Torq Box Made By Shuert Industries



Inside Support For Tuff-Torq's Product



for the purchasing and maintaining of the internal packaging and Tennant would manage the box. The internal packaging could be single use to make it cheaper and less important if it made it back to the supplier. This would be easier for Tennant. However, the reduction in piece price would have to be negotiated because Tennant may not be able to have the full packaging price returned. Another possibility is that the full packaging price would be taken out of the piece price, but Tennant would pay for all of the return freight.

There are three part numbers that would be excluded from the new, generic internal packaging because they need special packaging to prevent part damage; Tennant part number 222258 from Flojet, and 379001 and 379005 from Gorman-Rupp. These three part numbers would maintain their individual packaging, but would have reusable layer separators. Von Weise and Warner would need special packaging for their actuators.

RECOMMENDATIONS FOR THE PALLET & SLEEVE BOXES FOR 6 SUPPLIERS

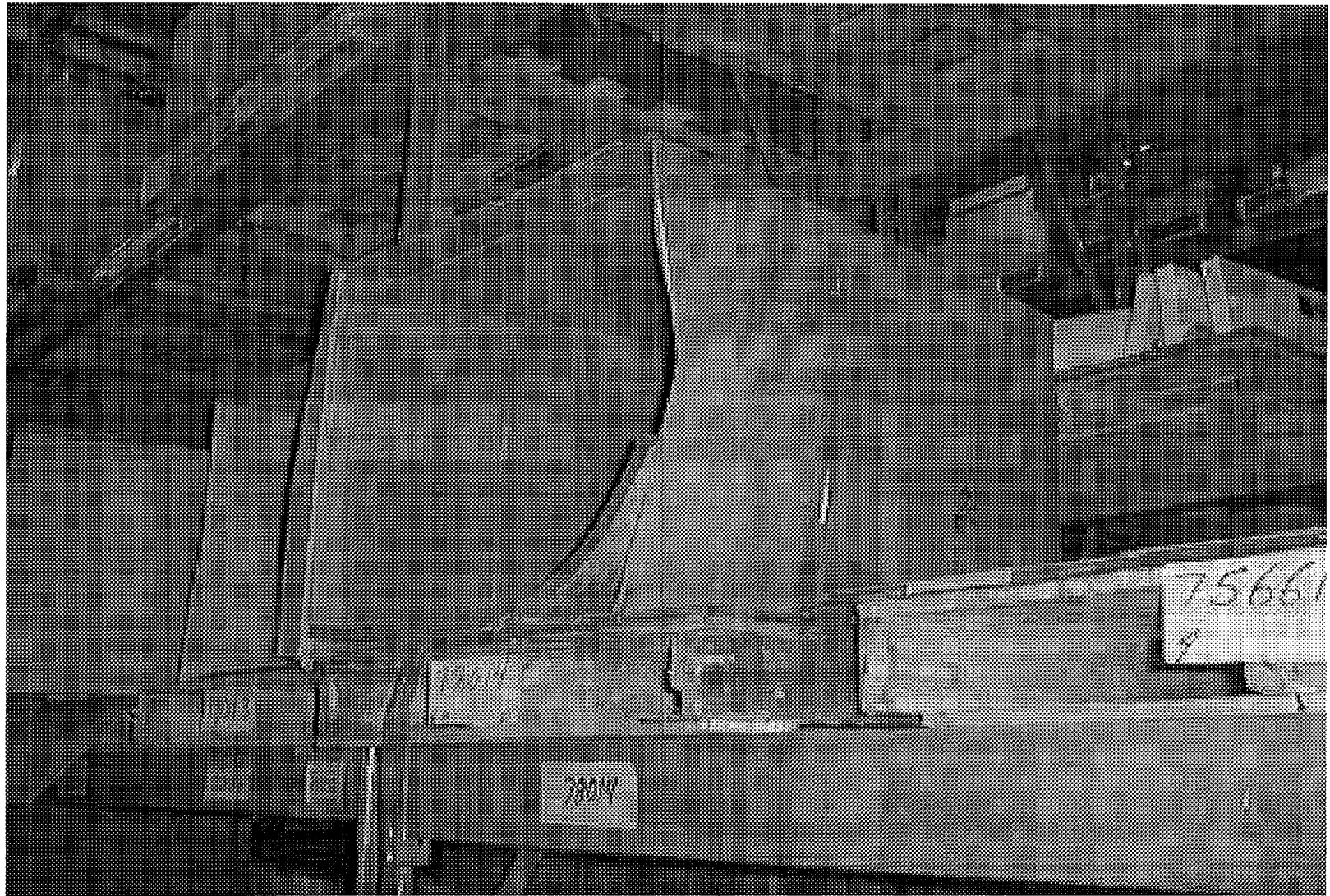
- Duane Davis needs to stay in contact with all six suppliers and try to work it out
- I will try to prepare information packets for each supplier before I leave
- Try to work with as many suppliers as possible
- Duane Davis: discuss with each supplier the possibility of them purchasing the internal supports

CORRUGATED PLASTIC BOXES

Applied Power Products (APP) makes foam and plastic spacers and insulation for Tennant. Tennant purchasing agent for APP is Jane Angell. I worked with Jane on contacting and discussing options with APP. A portion of the parts that Tennant purchases from APP come in 48"L x 30"W x 24"H boxes. The boxes are single use and cost \$5.22 each. When the piece price of the parts was negotiated, APP did not realize how expensive these boxes would be. Therefore APP is very interested in going to a reusable box and has been asking Jane about possibilities for years. I have included on the next page a picture of one of APP's current boxes.

I meet with APP and we discussed changing to re-usable transport packaging of exactly the same dimensions as the current box, except that this box would be made of corrugated plastic. It would be similar to the pallet and sleeve box for Centro and Pawnee, except that it has a

A Box From Applied Power Products w/ Their Product Inside



bottom and a cap and must sit on a separate wooden pallet. They seemed to like the idea, and Tennant likes the current size because it is the size of a Tennant standard pallet. Changing to reusable packaging has less logistical problems here because the reusable boxes are the same size as the boxes that they are using now and they do not put in level dividers.

APP supplied me with a complete list of the parts that come in these boxes.¹⁹ When I asked the Plant Manager at APP, Jeff Olson, how many of these boxes they buy per year, he said 210 or \$1,100 annually. I do not think this is correct, but that is what I based the current amount of money spent annually on boxes for use in calculating the payback period. I calculated 395 boxes annually come into Tennant from APP, based on annual usage and the number of parts that fit in a box, and assuming that all boxes that are delivered are full. However, not all boxes are full because some parts are very expensive, so only a few are ordered at one time. Therefore, 500 boxes delivered annually is a more realistic number. 500 boxes, at \$5.22 each, is \$2,610. The following is based on my calculated, realistic number of boxes per year and on a one month cycle time. I calculated that 145 corrugated plastic boxes would be required. See Appendix F for a complete report on all of the calculations. The cost of the boxes is \$24.82 plus a one time die charge of \$445 for a total investment of \$4,000.²⁰ Therefor the pay back time is 3.7 years, based on the fact that APP told me that they only buy 210 boxes annually. Plastic card holders will also be attached to the side so that labels and bar codes can be inserted without damaging the carton. By implementing re-usable transport packaging **1.62 tons of cardboard will not come into Tennant Company each year.**

An important element for implementation of the use of re-usable transport packaging for APP parts at Tennant is training. The warehouse personal at Tennant must be trained on how to use these boxes. Currently, Tennant employees cut the fronts off of the existing boxes for easy accessibility. This would ruin one of the plastic boxes. To accommodate employee needs, the sleeves on these boxes will be split on the length allowing the fronts to come off. See the drawing below.

¹⁹ See Appendix F for the complete list

²⁰ See Appendix H for the quote

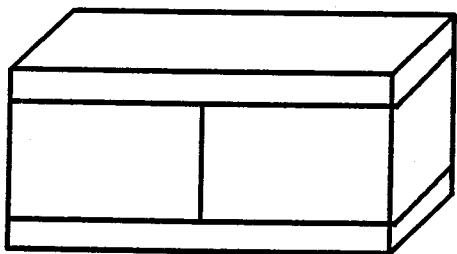


Figure 3: Box completely assembled.

The front piece that was removed can then be folded and pushed along the side of the box. Then the cover will rest on one side that is half the length of the box, and the other side, with the front pushed in along this side, almost as long as the box so that the cover does not tip off. See the drawing below.

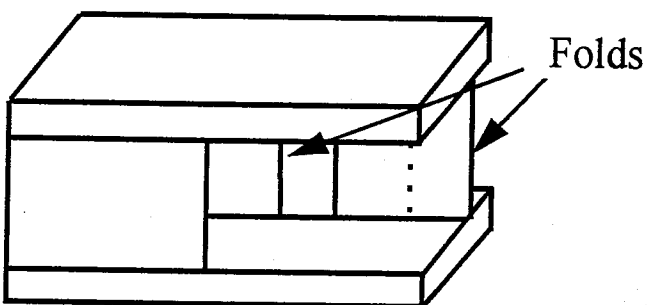


Figure 4: Box with the front panel removed, folded and tucked along the back side.

In addition to the type of box discussed above, Tennant also receives an 18 inch square box from APP. However, only 60 of this size box are sent to Tennant each year. The current boxes are relatively inexpensive. I did investigate re-usable boxes but switching would be quite expensive because of the design and low quantity.²¹ Therefore, Tennant and APP decided not to pursue this area, at this time.

The issue of whom will pay for the boxes will have to be negotiated by Tennant with APP because currently the price of the packaging is not figured into the cost of the part so the savings of switching to re-usable boxes is assumed totally by APP. There are three options. First, Tennant could purchase the boxes because the product in the boxes belongs to Tennant Company. Second, Tennant could pay the die charge and APP purchased the boxes. Finally, another option,

²¹ See Appendix H for quote of similar size box, 20" square

suggested by APP, is to split the price right down the middle so that both parties have a vested interest in the project. Jane said this is something that she will have to think about. It was agreed that APP would purchase a hand made sample from Convoy Containers, the manufacture of the corrugated plastic box, so that everyone could see what it would look like. The return shipment is not an issue in this case because APP sends its own trucks to Tennant.

RECOMMENDATIONS FOR CORRUGATED PLASTIC BOXES FOR APPLIED POWER PRODUCTS

- Jim McMicheal and Jane Angell train warehouse personal with the new box
 - So they do not cut it
 - So they learn how to open and fold it for easy use
- Jane Angell should decide whom will pay for the boxes and what percentages
- Decide where the money from Tennant will come from
- Purchase and implement the boxes

PARKER & CURRENT RACKS FOR HOSES

Parker makes the hydraulic piping that goes on many of Tennant's machines. Tennant purchases hundreds of different part numbers from Parker. I discussed options for change with Rich Carlson, the purchasing agent at Tennant responsible for the Parker account.

Currently, Tennant uses kit racks that contain all of the hoses produced by Parker for the 355 and 385 machines. These kit racks are made of metal and have plastic bins attached to them. There is a picture on the next page. The cart on the right-hand side is the one in the shipping loop between Parker and Tennant. The cart on the left-hand side is filled by warehouse personal, but it shows what the hoses look like. The carts are sent back and forth between the two companies for filling and emptying. Two more kit sets on racks will be implemented by the end of the year for the 800 & 8410 production lines. Currently, these lines can use up to 90 different hoses per machine. So implementing these new kits will help reduce the amount of packaging waste generated.

Rack For Parker Hoses (left); Parker Hoses (right)



Parker is starting a tote system with Toro in Iowa, but Rich was unable to see one of these totes at the Lakeville plant, where Tennant's parts are made. These totes are being purchased by Parker to be used at Toro. Tennant should pursue implementing a system similar to this at some point in time. However, it may be awhile before this is possible at the Lakeville plant.

Parker has also expressed interest in having the pallets that they deliver their parts on, about 60 per delivery with 4 deliveries per week, returned. This would be good for Tennant be reducing the number of pallets to dispose of. Issues to be resolved are; where the pallets would be stored while waiting to be returned, would they be stamped with Parker's name, who would pay for the return freight and how often could they or should they be shipped back. Therefore, at this time it would create more problems than it would solve. However, Rick Carlson and Rick Abrahamson are going to meet to discuss the possibility.

RECOMMENDATIONS FOR PARKER

- Kits are great
 - Do more with other lines
 - Space not an issue because can go back almost daily
- Rich Carlson continue to pursue implementing a tote system at Tennant similar to Toro
- Not return pallets at this time, more trouble that it's worth
- Rich Carlson and Rick Abrahamson discuss the possibility

RECYCLING

While the focus of my internship was to reduce waste coming into Tennant, it became clear that recycling was also an important component. Recycling should be addressed in conjunction with elimination because it is impossible to completely eliminate waste coming in.

PLASTIC RECYCLING

Tennant Company has large amounts of plastic coming into the facilities daily. This includes large plastic bags from Centro and stretch wrap from various suppliers. Upon recommendation from MnTAP, I contacted Ken Puckett Poly-Film Recycling to discuss possible plastic recycling options. They would be willing to help Tennant find a bailer or they would bring

in triple wall boxes for collection. Ken Puckett Poly-film Recycling could pay Tennant Company for the plastic if the purity was high enough and if Tennant produced enough plastic to make a bale.

Tennant decided to try out plastic recycling to see how well it worked out with Ken Puckett Poly-film Recycling and how much is being generated. The first week Terri Littlefield (day time custodian) called Ken Puckett Poly-film Recycling when the plastic needed to be picked up. Then Tennant was put on a route to be picked up every Friday (usually, 4 - 5 gaylords). The approximate weight of each gaylord is 40 - 50 pounds of plastic. Tennant does have a scale if they want an exact weight. Tennant likes to keep track of this to see how it fluctuates and where everything is going.

Ken Puckett Poly-film Recycling prefers to pick up 5-6 Gaylords per pickup. However, Tennant has a limited amount of floor space for any type of storage of this magnitude. So Terri Littlefield and I tried compacting the plastic in a can crusher that Tennant currently has, to reduce the volume and increase the weight. Although a good concept, this did not work well. Therefore, I started looking into the possibility of purchasing two bailers (one for each Plant) to bail scrap plastic in. Tennant has done business, in the past, with Ver-Tech. They retro-fit bailer so that it is specifically set up for plastic, at a cost of \$3,900. It makes a 30"x30"x24" bail. They also have a couple cardboard bailers that may work for \$2,500 each. One of them is 42" across and the other is 36" across. I called many other bailer suppliers and Ver-Tech seems to be the best so far.

The one designed for plastic would work well. However, it is expensive because Ver-Tech does not have any used ones available. The ones created for cardboard would be fine. The advantage to the cardboard balers, is that they are cheaper, because they are used and do not have custom features. They will also take up less space than the storage of 5-6 Gaylords.

Finally, it was decided that baling was the way to go for space and convenience reasons. A new person in maintenance, whom has extensive experience with balers, was consulted on whether or not a special baler was needed that was specifically for plastic. He said that based on his experience it was not necessary to have a special baler for plastic. It was also decided that if a new or used baler was purchased it would be a larger baler, 60", the new one would replace one

of the current 60" balers and the old one would go in the compactor room for plastic.²² Tennant has decided to purchase a 60" baler for Plant I to be put in the compactor room next to the current 75" cardboard baler.

It was agreed upon that Terri Littlefield, and a few select others, should be the only ones that put plastic into the baler so to insure that the plastic's purity is maintained for the recycling company. The plastic bags help with purity because they do not have any labels on them. However, if Tennant wants to be paid for the plastic the labels must be removed from the scrap plastic stretch wrap. Therefore, everyone will be asked to cut out or tear off the labels before bringing them to the compactor room. All recyclable plastic will be put in a designated box. See then next page for a picture of the plastic being collected in the boxes. Then Terri Littlefield will put this plastic in the baler after checking for any forgotten labels and remove anything from the box that is not plastic. These procedures will keep the operation controlled and maintains the recyclable plastic purity which makes the plastic more recyclable, reducing Tennant's costs.

Currently, nothing is being done with the plastic at Plant II. One of the options is to have Plant II send their plastic over here to be bailed because they may not have the necessary volume or extra room for a baler. Another option is to purchase Plant II a baler of it's own. Jim Hawkinson, member of the Source Waste Reduction Team & a manager in Maintenance, has decided that purchasing a 36" baler for Plant II is the best course of action. Now Plant II will have separate pick-up by Ken Puckett Poly-Film Recycling.

TRASH

Currently, a variety of people throw things into the trash compactor. Some of them do not realize or perhaps care that many of the things could be recycled. For example, people will throw boxes and plastic in to the compactor. Then anyone can push the button to push the trash back into the container. However, if this button had a lock on it only a select few could push the trash back and the boxes and plastic could be picked out, within reason, and put in the proper receptacle.

Maintenance decided that a combination lock will be put on the compactor. The people that would know the combination would include Terri, a few other people on days that help her

²² See Appendix G for a picture of a baler

and the night custodial crew; all people that understand the importance of recycling. This would increase the amount of recycled material and reduce the amount of trash.

TYVEK™ SUITS FROM THE PAINT DEPARTMENT

Tyvek™ are worn by employees working in the paint department in order to protect their clothes and skin.²³ Currently, this operation generates about 8 suits per day that are thrown into the trash. Another option, to reduce waste, is to send the suits to recycled by a company called Tyvek MPE, given as a source by MnTAP, through cleaning. The suits are thrown into a plastic bag. They are shipped to Tyvek MPE. Tyvek MPE pays for the shipping and also \$0.25/garment. They separate the garments and determine which ones they will pay for and return a statement to Tennant saying how many were sent and how many were paid for.

The people at Tyvek MPE clean the garments through a process of removing the dirt, and then bleach to return the white color. The garments are sold to machine shops and paint departments to use to be re-used. The ones that they do not pay for they do recycle. I have set up a program to start this.

The paint department made a special barrel that the used Tyvek™ is collected in.²⁴ When it is full they are put into a cardboard barrel for shipment to Tyvek MPE.

When Tennant sent its first shipment to Tyvek MPE to be cleaned they disintegrated during the process because the ones that Tennant uses are not coated. Therefore, Tennant will not be able to send its garments there anymore. Tyvek MPE does sell the garments that they cleaned, so I asked for a price sheet and a brochure. Perhaps Tennant can purchase the garments that have been cleaned. The only problem is that they may be too hot for the people on the paint line to wear because they may not breath like the current un-coated ones.

WOOD AND WOODEN PALLETS

As mentioned before, 2 semi-truck trailers leave Tennant every 7-10 days full of wood and scrap pallets. These pallets are from the hundreds of parts that come into Tennant each day. Currently, Tennant hires Pallet Services for the wood disposal needs. They take the good pallets for free and resells them and then charges Tennant \$150 per semi-trailer to haul away the scrap

²³ See Appendix G for a picture of the suits

²⁴ See Appendix G for a picture of the barrel

wood to Dunham Brothers to be ground up into pulp. In addition to the cost, Tennant has been unhappy with Pallet Services service.

To help Tennant find an alternative pallet recycler, I investigated new companies to take Tennant's good quality used pallets and scrap wood (broken pallets, odd sized pallets, wooden crates, scrap wood, etc...). I contacted and meet with Pallets Unlimited. They will take apart the scrap wood and re-use what they can and re-sell the good pallets as used. As far as the environment is concerned this company appeared to be the best choice. They also seem to be very committed to the customer and service. Unfortunately, Pallets Unlimited said that they do not think that they can take on any new customers at this time because they do not think that they could keep their promises to Tennant. The problem is that it is the end of the summer and many of their workers are going back to school. The did say that if Tennant would like to contact them in a few months, after they have hired and trained new people, they may be able to take on new business. Tennant respects Pallets Unlimited for their honesty on this and will look to talk to them in the future about setting up services.

GRAY BRUSH BACKS

Gray brush backs are manufactured by Carris Reels, and made of polypropylene. They are the backs of the Tennant scrub brushes. The brush backs are drilled on half of a special machines and the bristles are then added on the other half. However, when they are drilled, shavings come off. I was contacted by the maintenance supervisor at Plant II and he wanted to know if this material could be recycled. I asked him to contact their plastics recycler to see if they would take this material. It would not be difficult for the workers to but the shavings in to a recycling receptacle, because currently they have to carry a duffel like bag to the trash to empty it. However, these machines also drill wooden brush backs, so the only stumbling block would be that the workers would have to remember to empty the bag before starting the new brush backs.

I discussed this issue with Jeff Haynes, the brush manager, and he said that it is not feasible at this time for three reasons. First, there is not very much volume. Second, the current people that recycle the drill shaving for the black tubular brushes didn't want the gray drill shavings. Third, Plant II doesn't have anywhere to store the 20 gaylords per week from the black shavings, much less an extra 5 or 6 gaylords a week of the gray shavings.

ADHESIVE

Plant I has a large amount of stretch wrap coming from Plant II and outside suppliers. Therefore, I wanted to find a product that could be used in place of stretch wrap. I was able to find a product from 3M called *Palletizing Adhesive*. It holds the boxes together during transport, but when they arrive they can be pulled apart one by one without any damage to the box. I contacted 3M and they sent me a sample of their palletizing adhesive to replace stretch wrap for boxes. The trials that I ran showed that the boxes held together well even after being thrown into a wall, stomped on and kicked. However, when I tried to pull them apart they came apart, with a reasonable amount of force applied, without damaging the box. Jeff Haynes is going to try it out to see how well it holds the brush boxes together. Then if it works out well they may start using it between the two Plants.

CONCLUSION

I learned a vast amount about transport packaging during my time at Tennant. I learned about the variety of materials available and the pros and cons of each. I learned how to better defend my ideas and to know which parts of the idea were most important to different individuals; i.e. money, protection, feasibility etc... I met many different people and interacted with Tennant employees and suppliers.

If all of the projects that I proposed were implemented 43.4 tons of cardboard, 59.2 tons of wood and 0.56 tons of plastic, for a total of **103.2 tons of waste, would be eliminated from coming into Tennant Company annually**. These projects would have an initial, one time investment of \$108,900. However, **\$94,500 would be saved by Tennant annually**.

The reports I created for various projects and suppliers were done in a manner that would hopefully allow someone in the future to look at them and produce a report of their own that would accurately display the feasibility of a type of packaging being considered. I want the things that I did at Tennant to be understandable enough that with careful inspection, someone can continue what I started or start a new project.

I fell that transport packaging will become more and more important as the worlds resources for producing and disposing of products decreases. Therefore, everyone needs to understand how important this is before it is too late.

LIST OF CONTACTS

CONTACTS AND PRODUCTS

Company	Contact	Phone Number	Product or Service Type	Product Description
3M	Product Information	(612) 737-6501	Any 3M product	Direct you to correct division
Amateck	Gene Ueal	1-800-354-8995	Microfoam	Sheets of foam used in paint & assembly
Containair	Ken Kutner - see notes 7/14, 7/15	(718) 276-6500	K-Box	Pallet & Sleeve
Convoy Containers	Darrin Newman or Sarah Biedenbach - see quotes, catalogue	(330) 453-8163	Corrugated Plastic	Boxes, Totes, Lid & Sleeve
Distributor for Equipment Sales & Service	Mike McGuire - see file	(612) 777-0965	Orbis, Springfield Bag, Schaefer	Bags, Plastic Boxes, Pallet & Sleeve, Corrugated Plastic, etc.
Du Fresne Manufacturing Company	Bob Du Fresne - see notes 7/23	(612) 483-8130	Spools	Metal Fabricators, so a variety of things are possible
Independent Packing	Sam Cleveland - see notes 7/30	(612) 425-7155	Packaging	Crating, Corrugated, etc.
Ken Puckett Poly-Film Recycling	Ken Puckett - see notes 6/7, 7/14, 7/22, 8/5	(612) 721-4064	Polypropylene	stretch wrap, plastic bags, solid plastic, poly-foam, etc.
Longview Fiber Company	Bud Audet	(612) 865-2436	Corrugated Cardboard	collapsible, triple wall
MN Office of Environmental Assistance	Ken Brown - see notes 7/8	(612) 215-0241	Information	Name given to me by Fran Kurk
MN Technical Assistance Program	Fran Kurk	(612) 627-4643	Information	Project Supervisor
Packaging Solutions	Harry Mouloupoulios or John Radtke - see notes 8/1, 8/4	(414) 483-2727	Uni-Pack by Shuert	Pallet & Sleeve box

Company	Contact	Phone Number	Product or Service Type	Product Description
Pallets Unlimited	Len Westphal	(612) 450-7404 or (612) 331-7123	Pallets Sales & Pallet Recycling	Sell used & new pallets; break up & re-use wood from scrap pallets
Protecta-Pack Systems	Marlyn Johnson - see notes 7/23 (quote), catalogue	(612) 540-9500	Pallet & Sleeve	double or triple wall
Schaefer Systems	Dwight Strand - see quotes, notes 7/18, catalogue	(612) 949-9046	Containers	collapsible & variety
Sternswood	Rick McArdle - see notes from 8/5 for quote	(612) 829-0922	Pallet & Sleeve boxes, with clips to secure sleeve to pallet	32 x 44(W x L) 40 x 48 44 x 48 45 x 48 44 x 54 Custom Sleeve Height
Stone Container	Rock Holmes	(816) 238-3301	Containers	Worked on new container design for reuse
Stone Container	David Halper	(612) 636-1220	Containers	Currently produces cartons for a variety of Tennant applications including brushes
Stone Container	John Dagenhardt	(816) 238-3301	Containers	If want to pursue interlocking containers
Tuff-Torq	Don Wieber	(423) 585-2000	Shuert user	
Tyvek MPE	Rebecca Risoya - see notes 7/17	(219) 865-3322		Recycle for reuse of Tyvek suits from paint
Ver-Tech	Fred Simmons	(612) 559-2590	Balers	Used, New & Special Plastic Baler

Another great source is the phone book. Just go through and call most of the people when it comes to pallets, balers, recycling, etc. They will usually tell you over the phone if they can help

NOTES

July 2, 1997

out w/Terri

Mando Machinery Car & Radiators
Crouse Cartridge Company 58120 filters
service only
Tuff Torq
5943 Commerce Blvd.
Morristown, TN 37814

Tanks 6-7 per day to Terry (more at night)
Tans Batter Boxes, Trojan Battery Company, Lithonia, GA

Brush Boxes?!!!
2 seats in a box
Bags on Ford motors
*Thermoform Plastics, Inc., White Bear Lake
(612) 426-7319 phone, covers ...
plastic bag and foam, 54342
1153 PO
Progress Casting Company All castings
Plymouth just box

Centro out of Iowa tanks (turquoise)
Bags, foam sheets, box 72991
346 CS

24928-1 Manchester tank now w/string but plastic
600 CL webbing to protect; used to be cardboard

July 7, 1997

Thursday was spent on the computer preparing the Excel spreadsheet of parts, quantities, etc.

Ken Brown out until July 8.

Call Ken Puckett, Poly-Firm Recycling, 721-4064

Requirements:

Trade containers or a bailer (they bring)
Labels always a problem, not a problem
Shrinkwrap
Plastic bags
Hard plastics
Stephen

Set up a meeting in a few weeks after we have identified what we can reduce.

Big rolls of foam

What are they made of?

John Heisel (Tool Crib)

Need to know how big are plastic bags?

Who makes Tuff Torq boxes?

John French (all cardboard boxes)

John Gunsch

Purchasing people

Rich Carlson deals w/Parker

noses and fitting

has kits now, may be more

some created but not done

Breadman program possibility (like hardware now)

buys wood products

totes for fittings (?)

Packaging Services currently do pallets for us. Used pallet market???

Toro

Onan - Jerry O.

Thermo King are doing

30 x 48

Warehouse

42 x 48

FTM floor coating more at Plant II

48 x 48

Brushes (light duty)

See what

other people

Possibly send pallets out Dick Weise (Plant II)

Battery

To not have brushes in boxes

Need 2 part numbers

Someone to put brushes in boxes for customers

Stand w/rod

July 8, 1997

- Finished up parts inventory
 - Will meet w/Rick Abrahamson later today
- Collapsible--how important?
Totes?
How fall about lots more boxes
Could we have bins where Parker hoses are now? They refill?
What about two part numbers for brushes?
Plastic

Ken Brown

Fact Sheet:

Reusable transport packaging video

Key Points

Back hauling loop?

Cost analysis on boxes vs. reusable

I have decided to concentrate on the internal brushes for now. They seem to be a large amount of waste. They are packaged in Plant II, then shipped over here (Plant I) and opened. I am going to walk around the Plant and Assembly areas to write down the part numbers of the ones being used here. I think this is the best place to start.

	<u>Quantity</u>	<u>BOH</u>
75722	746	72
75718	923	30
36699	499	76
87099	590	96
59431	3876	245
54923	2879	25
16182(?)	233	0
363403	434	51
70471	210	54
35326	938	22
80058	Sweep 1685	64
80042	Side sweep 3458	107
41457	Sweep 768	85
41673	Side sweep 2149	
59431	Side sweep 3876	245
66019	1616	47
54925	3517	24

	<u>Quantity</u>	<u>BOH</u>
59431	3876	245
66019	1616	47
54922	758	37
54925	3517	24
54923	2879	22
66018	124	28
54927	875	-1
370008	264	2
41673	2149	34
60340	938	0
41457	768	85

- Toro going to start using totes (Parker)
Parker bought them
John Deere already does (JD bought their own)
- Bags from Thermoform
 $6\frac{1}{2}' \text{ by } 6' = 796 \text{ ft}^3$
- Our pallets are 30" by 48"
- Brushes
Tomorrow work w/Rick Abrahamson on sizes/dimensions
Could these be put on racks?
How much racks cost?
How many needed?
How much are boxes?
How much would be saved overtime?

How long till investment repays itself?

Is Plant II willing to do this?

Can we create two part numbers?

- Service number stays same. New number for Assembly.
- Who would this effect?
- Is it possible to change the system?

- Spray adhesive for boxes
Left a message for Cyovac yesterday. No reply yet.
3M product information - 737-6501
Adhesives Div. - 1-800-362-3550, 575-5127
7:30 a.m. - 4:30 p.m.
Pallet adhesive normally used for plastic bags but might work here.
Propane propellant
Faxing over chemical list
Sending a sample

7/9/97

- Brush sizes from Rick today or tomorrow.

Internet search

www.nefab.com
search.yahoo.com

- Don Wieber, Tuff Torq Corp.
1-423-585-2000
left a message

Thermoform 80468, 14444, 08911
294, DO, JF/617, PO, JF/901, PO, JF

- Racks back in area near Final Test.
Where did they come from?
Who made them? Ross Solum
What is part number? 222312
Ross Solum X1739 Industrial Engineer made rack

Dick Ostman (racks Kemway area)

Jim McMichael - Ask about racks. Doesn't know. He will ask around.

Racks Bob Stier in Product Development, 540-1288. He actually made it. Ross took him two example brushes and asked him to make it.

Tuff Torq Boxes

Shuert Uni-Pak, Sterling Heights, MI, (810) 254-4590

1 p.m. - Left name and number

Dan Ryan, Lakeway Container, Inc., (423) 581-2164

Jeff Haynes, Brush Manager, Plant II

- Brushes
Used to be on spools
Jim Lund 1405 scheduler for production
How many each machine then

- Pallets from vendors to Plant II for FTM
Ask Rick
- Midwest Rubber - Local (?) - Yes, Plymouth
14307 - 28th Place No., Minneapolis, MN

To Do Tomorrow

- Contact Jim Lund, x1405
How many machines?
What brushes are on those machines?
- Contact Jeff Haynes, Brush Manager, Plant II, 424-1361
- Talk to Rick about what happened to sending pallets to Plant II for FTM (maybe brushes).
Dick Wiese about coming to Plant II on Tuesday, July 15, 424-1350
- Start some economic analysis on brush racks/spools.

7/10/97

Left a message for Jim Lund at ~ 8 a.m.

Foam Dupont microfoam 5

Jesco (buy from) - Amateck, 1-800-354-3995
PBT Company Saddle Brooke, NJ
cellu-mask, sealed air
cell-aire

- Don Weiber
Baskets from suppliers, interlock
4 x 4 x 4
- Collapsible boxes Assembly and/or Service Centers
Patrick Hargarten, Manager of Transportation
- Stone container, John French
- Brush poly stuff, comes in big long things.
Cut ends recycle? Cut sizes and make brushes
Brush wrap paper recycle (?)
Donny Luciger (custodian)
Mtce Supv, Bob Marty
Old brushes, pet supplies
Cow back scratches

Plant II

- Sheet Metal Dept., as to recommend metal fabricators. Ossoco(?)

Tom Runyon

- Carroll Smith, Supv, Welding
After rack specs, what type of material(?)
- PDL Lab
- Can it come apart, put together
rack - cut off top two, make 1/2 wider on other racks so 5' across ~ 5'3" tall
top and bottom one
spools ~ 1/2' off ground _____
- Box with dividers one way and string other way
- Trailer ~ 92" across
- Plant II measure Trojan battery pallets for brushes

7/11/97

6080 - Started April '97. Talked to Jim Lund at 8:30 a.m.

7700 - Started April '97

- Rack specs (current one)
8 racks
5'5" w/o casters
6'1" w/casters
metal frame made of 2" square metal
2'2" across (metal frame) rack 2' long
racks 3'1" long (37")
8" from top of one rack to top of another
- For the boxes
4'5" high (52") 48 long
4'10.5" long (58.5") 40 wide
3-1/3' (40") wide
width dividers @ 20" and @ 13-1/3" and 26-2/3"
length dividers (slots) @ 195", 13.5", 27", 41", 54.5"
- New racks
6 racks with lock/clasp
rack portion
57.5" tall w/o casters
so have top of rack at 11.5, 23, 34.5, 46, 57.5 and at 19, 38
long - 48"
wide (rack) 1" margin each side
9's = 1", 10.5", 20", 29.5"
12's = 1", 12.5", 25"

Classic machine in Osseco

Sheet Metal Supv., Larry Thole, 424-1346

John Hisel recommended

Tom Runyon, 424-1349

message at 10:30 a.m.

Dick Weise asked about how many brushes are stored to get ball park number, 424-1350. Wait until I get there!!!

Internet - 1-800-441-7515, Dupont

Foam Anateck, 1-800-354-8995

Microfoam Call at after 12:15 p.m.

polypropylene, (606) 836-0251, x152

Spools

56" long

30" wide

12" stop at bottom of each spool

45" spool ~ 1/2" spool

2 spools 27" apart (from center)

~ 6 of 7" ers

~ 8 of 5" ers

- New Rack

Rack w/o casters:

57.5" tall 20 of 9" ers

30.5" wide 1.5 of 12" ers

49" long 6 of 17" ers

Racks at 11.5", 19", 23", 34.5", 38", 46", 57.5"

Slots at 1", 5", 10.5", 12.5", 20", 25", 29.5"

Frame w/o casters

62" tall

37.5" wide

58" long

spacers = 19", 11"

Tom Runyon

Du Fresne

Harmony

Material Control, Plant II

Model 5700 reusable container

7/14/97

- Rack/frame fork bar
- Specific racks for lines
how managed
- Different part numbers--how difficult?
Duane Davis

Contact Plastic people

- Frame for spools

Posts on each corner 60" tall
Do we need to connect them?
Need spacers at 1-1/2" tall

Shuert

Minimum of 300 = 150 sets on sleeve	22.01 each one
split sleeve	50.29 per top 125.25
60" tall	74.96 pallet
47114 x 60	

Ask about samples(?) 7-8 weeks
Dividers
Buy more w/Thermoform

Plastic recycling: both buildings
paper-tape-labels
Gaylord boxes (what use)
usually 6 or 8
up to 5¢ clean (totally)
usually for large amounts
zero cost pick
Ken Puckett
721-4064

Talk to Terri
Get a receipt (know how much) how often
Run it by Jim H.

Thermoform
2'11", 2'8", 5'4"
35", 32", 64" long
Left a message for Dick Weise
Jeff Haynes: will be in tomorrow, 424-1361
and Dan Ryan

Longview Fiber Company (Directory)

Left a message 865-2436
Bud Audet

Contain air

Insta-crate
KS 48 x 40 33" high
Ken Kutner
Could custom make (mainly just higher) but need to talk to Ken
Don't make dividers
(516) 483-6778

Protecta-Pack Systems

Marlyn Johnson

Double Wall or triple wall (twice as much as double)
6 tubes within a sleeve

Gate Pallets Sys.

Carol Urban (message)

7/15/97

Longview Fiber Company
Bud (message) ~ \$5/piece, Nancy Cook
200 lb. double wall

Container

Ken Kutner
C08 58" x 41" 45" would have to lay down; will not work

Berg Bag Company, 332-8845
Called Bulk Bags \$ is each, used
These would be expensive!!
45" x 40" biggest they have (bags)

Bulk Pack, Inc.
~ \$30 - \$35 each
Trisha Creighton, Sales Service
Fax: (318) 387-8871
They would take a look

Springfield Special Products (bags)
Mike McGuire, Sales Rep in White Bear Lake, MN, 777-0965

DPI

Totes
Steve Studler, Sales/Mkt MN
Sending catalog

Industrial Custom Products Totes
Tom Mundstock

Regal Plastics, 1-800-852-1556
Lewis Haker

Strait Plastics
John Scully, 703-0517; 881-8673; 469-3270

Springfield Plastics
Mike McGuire, 777-0965 Couple hundred for knock-down boxes
~ \$18 per bag
(more)
woven poly
Unidex rough price \$15 - \$25/bag

Jeff Fliss talk to about containers

Stone container

Dave Schraner, Packaging

Convoy, Inc.
Custom possible
Darrin Newman

Bradford Company
On hold too long

Imperial Custom Molding
Collapsible cardboard box
5700 line shrouds 428-8359 (fax)/428-8310
Mike Louris, x119
Steve Jenkins, x165
No tops \$1.76 ~ 10 trips/box

Centro Puma Tanks going to start
222585 (part number)
stone container

7/16/97

Jeff Haynes
Abrasive material ends thrown away
Drill shavings recycled
Put plastic in hopper outside(?)
Who: Discover Plastics(?), 593-0160
Scott
Wet Bad
Every 2 weeks
8-12 guy
Trimings from brushes thrown away
Floor space!!!
Collapsible
Stone containers for large diameter brushes
Make poles removable
Prefer to start with side sweeps
New order number most likely best
Different routing (?)

Use can crusher for plastic spools
Warren Larson, x1511 Brush guy
5/8", 2-1/2
Spacing in openings
Smallest dia. and larger dia..

Stone container
Sales Manager, Deter Winkler (message)

Ken Puckett
Pallet size box, no more the one-month between pickups; gave them Peg's number.

Redesign spools
56" long

30" wide

1/2" diameter pole w/3" diameter washer for a stopper 10" above top of pallet with a compartment in the center support of the pallet for storage of the poles with a flange coming up from the bottom ~ 1/4" to hold the pole in place

Rick - can it be on skids or not?

7/17/97

Pages 1 and 2 and some on page 3 come over in shrinkwrap. Imperial, Steve Jenkins

Tyvek MPE

Buy back; they pay shipping

25¢/garment

booties; they don't pay for them but will take garbage can

counted and separated there

Rebecca Risoya, (219) 865-3322

Stone container

Rock Holmes; call me later

Patty Otten, 424-1347

Warren Larson, x1511

Union mix paper wrapping

rest plastic

3M

1-800-362-3550, Adhesive Division

Warren, 378-7300

Jesco, 536-1288

Elsworth

\$7.87/can - 12/case

Told Bob Marty, 424-1354, to put all paper brush fill wraps into compactor

ICM

191	10 x 10 x 10
162	12 x 12 x 12
68	14 x 14 x 14
<u>359</u>	16 x 16 x 16
Subtotal	780

214	18 x 18 x 18
<u>336</u>	20 x 20 x 20
Subtotal	550

Total Boxes 1,330

Longview Fiber Company, Bev

250 to 300 per order

20 x 20 x 20 box

7/18/97

Stone container, (816) 238-3301

Message for Rock Holmes (816) 390-5373

He is sending a sample that is 54 x 40 x 52

Schaefer Systems, 1-800-876-6000

Laura - Part No. FK6420D

Referred from McMaster-Carr - Candi, (630) 834-9600

Duite Strand Sales Rep for MN, 949-9046

~ \$48

MDM Packaging

Stock big ~\$20 woven poly 48 x 48 x 48

Unidex - Move stock bags out of Chicago

Mike Fogarty

Flat bottom, duffel top

usually in bundles of 25

like to sell 100

7/22/97

Ken Puckett

100 lbs. large volume

36" bailer ~\$2,000 used, \$4-5,000 new

Maybe some value then

Stone container, St. Paul Plant

Costly option, die cut slots

~ 25 - 30% more

Staples create a mess

What is purpose behind Centro & Thermoform bags?

Called Convoy - corrugated plastic totes

Sarah

7/23/97

Mike McGuire

3:26 p.m. 7/22

Faxed over price of containers - \$55.15 each

Jane Angell

Will find out parts per box

They bring on Friday

What lines get part #59431

2 pallets	12.9	1.24 brush/day	6400IC 3114	28096P
1 pallet	61 days	.26/day	6400E 64	21S/All 127
3 pallets	6.72 days	2.38/day	35S 594	.51/day
				31 days

1 pallet	181.8 days	.088/day	355E 22	1 pallet
3 pallets	9.58 days	1.67/day	385 418	
<u>1 pallet</u>	72.7 days	.22/day	385LH 54	
11 pallets				

1 set on lines Warehouse Plant I
 1 set empty
 1 set being filled
 1 set storage Plant II

12 pallets

= 44 pallets + 6 spare
 = 50 pallets @ 174.49 each
 = 8,924.50 capital investment
 \$2,008/year currently

9,247.97

48 pallets + 5 spares
 53

4.61 years

= 4.34 years for return on investment

Could maybe cost \$500-\$600 for prototype

Du Fresne quote \$174.49 for each of 50 units

\$70 material
 \$60 welding labor (1¾ hours)
 \$44.49 (balance) rest of labor

7/23/97

How many will imperial really need?

220 part nos. fit in totes
 Assume only 1 tote in each of 4 places

T. Warehouse
 empty

revise x 3
 = 660

being filled

ICM Warehouse

= 880 totes in circulation

110 part nos. fit in boxes

Same assumptions

x 3 = 330

= 440 boxes in circulation

Mike McGuire called out of office till

Monday call Dave Bruckner from Equipment Sales & Service w/any questions
 1-800-877-7028

John Degenhardt, (816) 238-3301

Stone container, St. Joseph, MO

If want to pursue interlocking boxes for brushes further

Protecta - Pack Systems

Marlyn Johnson

\$47.70 wooden pallet included--would fold flat
 500 DW

Replace component parts

7/24/97

Quotes Schaffer \$47.25/each for 500

Convoy Quotes

- Can crusher doesn't work for plastic
- Called Ver-Tech, left a message w/guy who handles Tennant's accounts (559-2590)
- 42" bailer \$1,000 - \$1,500 used idea from Ken Puckett on how much one should cost

How many boxes for tubular brushes would be needed?

Part No. 41457	87097	59423
Assembly Line 140 297	6400E 30	385 149
	6400IC 100	355 85
		355E 2
59425	66019	35324
385 64	385 32	800 104
385LH 34	355 36	810 5
355 140	355E 2	5.2/month - 1 box
355E 5	3.5/mo - 1 box	

Ver-Tech (55 past 494 to Vicksburg, go left, 2nd left at Medina, 1st right into parking lot)

Stretch only ~ 250 lb. bail 30" x 30" x 24" bail Used for 2 weeks only
10% discount — ~~4360~~ - 10%
= 3924 ~ 200 to get

- 4 tie slots
- bail retainers to keep plastic down
- shut door so doesn't come back out at you

42" x 20 would work	Used cardboard bailer
\$2,500	
36" x 24 \$2,500	3 Phase 250 volts

Fred Simmons, 559-2590

Accountability (who is? we are?) Imperial meeting

Count in and out
SAP
Quarterly counting

Collapsible: 20" x 20" x 20" Pallet style
18 x 30
15 x 24

7/25/97

Darren Newman, Convoy
18" square box

20" square box
48L x 30W x 42H pallet/sleeve

Split sleeve for Applied Products

Month	Applied Have	Need	Extra In System
1	33	33	18
2	15	15	18
3	18	18	15
4	18	18	15
5	17	17	16
6	17	17	16
7			
8			
9			
10			
11			
12			

So you have four places they can be
Tennant Assembly
Empty
Being filled
App Warehouse

But extra in system seem to account for empty portion so multiply number by 3.

= 99 + 15 spare = 114 - will need a new quote

Model 6080-Panda-PAWNEE

20911 cover kit - 468 per year
reusable cardboard
5-6 turns
Tennant truck
Better ____ of freight/ing
520 per year

Model 7200-PAWNEE

Wooden kit


Model 7400-SOLAR

Wooden kit

Model 6400-SOLAR

222125 Centro
front cover
2,849 pear year

Model 8410-CENTRO

Marketing  another entry under Model 5700-Centro

Model 5700-CENTRO

Single wall box, bag, 70 per week

Model 530-PAWNEE

150 per year

Model 515-PAWNEE

640 per year

7/28/97

966-3941

For spools need to add part #80042. Say need 623 this year
52 per month = 4 pallets

4 + 11 = 15 = 60 units + 5 spare

\$ _____ 2.93 years to pay back
\$11,341.85 3.17 years

355 Line Bob Luck 6080 line

APP

2/6 on June 97

208 on May 96

\$5.22/box ~ 210 boxes/year
= 1096.20

985-5800
direct line

Are those tanks from PAWNEE coming in reusable boxes? Part #369335

7200 line

Yes, but going to TNV

Wood Shop, John Hamner

See Rick too

30042	14" Dim	5" high
59431	24" Dim	8" high

7/29/97

Rita Maehling - Talk to her about background of Tennant

Personal

Stan, 571-8330

Peg gets Tyvek stuff.

Becky - plastic

Dunham Bros., 469-2427

Pallet services (now)

sorting all pallets

32 x 32 to 48 x 48

mostly good & bad condition

1 truckload

every 7-10 days

All others

crate, boxes, boards, wood, all other

King Plant

Call NSP if want starter and ____ of

free

Ver-Tech Close, just happened that way

Centro 222125

1/3W x 34 x 33

2,849 per year

5700 222585

34½W x 50L x 34½H

Same 2,142 per year

222195

Price per package/trip

223400 shrink wrapped
22467
222168

Scenarios working on for Centro
#1 currently

7/30/97

Look for a new pallet service.

NSP 330-5674 Procurement
Not interested; wouldn't be able to give us anything. Bob

Twin City Pallet Brian, 950-1952
Will call before leave.

Pallets Unlimited Mark, 331-9498
Will call back. Look at no charge for sure
Possibly pay

Shuert			
36 x 50 x 42		300 sleeve	24.85/_____
	tops	29.34 each	
	bottoms	43.59 each	
48 x 57 x 53		300	28.28
	tops	42.51	
	bottoms	63.33	

7-8 weeks
Bill _____ charge 150 - 3,500
1 time \$600 - \$700 ballpark

Mike McGuire 10:12 a.m.
Orvis Opte-Pack _____ sending info
Bigelow Bulk-Pak _____

Going to get us the samples of bags

Wants to know where line is for direct from Scheffer.

Recovery Systems Company Inc., 935-4330

Reco 42" x 30" x 36" \$4,750 new ~ 2,900 used
supply twine delivered 110 outlet
hot special for plastic
Could use a regular one put keep plunger
down when not using

AV Systems Int, 972-3420
Dave - Don't have them
Faxing some stuff

Twin City Baler, 884-7906, Kurt Berendt
Olympic: 42" ~ 3,200, \$125, fairly new
Tom - He will call Tom, call me later

Tilsner Carton & Pallet (O: 227-8261)
Bill - He will call back

Timberland Pallets Corp.
1.75 per 4-way 48 x 40
1.00 48 x 40 2-way, 48 x 42 2-way
 48 x 42 4-way

\$200 a load Dunham Bros. to grind
Pick up freight and trailer costs
But we pay \$200 to get rid of waste

But about 400 - 300 per trailer

Pat Sulliver, 618-8728 (cell #)

Independent Packing Serv, Sam Cleveland, 425-7155
Crating, corrugated; help us out?
Wooden crate w/fabric hinge
~ 200 turns (cycles)

47L x 44W x 42H \$250 + freight

How many pallets? 40' trailer = 480"
21H x 2W x 10L = 420 pallets/load
~ \$400/trailer
But \$200/trailer to dispose of scrap wood
Net \$200/trailer w/Timberland

Dunham Bros. - Just charge to chop it up
\$3/yard

Recycling
Rock-Tenn Co.
P.O. Box 4098
Norcross, GA 30091

Alliance Steel Service
Mike Zweig Baun, 588-2721
Roger Erdman, P2

7/31/97

Called Steve Dow again.

Polypropylene

Mike McGuire

Rick McArdle, Trienda, (219) 272-9858
54L X 40W around \$100-\$125
Portage, WI
Call on Tue. form nos. by Wed.

8/1/97

Twin City Pallet - Not interested

Imperial

Inventoried

6" diameter Brush drive plug
2" high ~ 50,000/year

Call Steve Rose

John Radtke at Packaging Solutions, Shuert Uni-Pak
Distributes
(414) 483-2727

Mike McGuire

Monday better for Opti-Pak Quote on 300-500 lbs., 3-5 high
Quote for 750 collapsible

8/4/97

Schaffer
No holes

(414) 483-2727
Harry Packaging Solutions

Steve Rose Centro
10.12 charged to us (total)
4000 - 3300

Harry M. Packaging Solutions

6080 25 a week next year, 100 per month = 7 per month

8/5/97

Spools Redesign

Stopper still at 10"
Spool = 27" long
However, wobbles at 24" spool
Could stopper have bars/sides for extra support?

59431

355: Line run is 18
9 per spool - okay
6400: Line run is
6080: Line run is 25
13 per spool, okay because smaller hole so hold in place better

Ken Puckett

Paper is minimal, good quality
~ 40 - 50 lbs. each Gaylord
Loose approx. wt.
Bales could get actual wt.
Gaylords this time ~ 200 lbs.

Balers

Blue 6'3"
J Yellow 5'

Sterns Wood, Rick McArdle, 829-0922

Trianda doesn't really have anything

54L x 44W - 35" sleeve

FOB postage - pallet 33.25 each

sleeve 22 each

FOB postage sleeve 8 clips secure sleeve to pallet - \$.50/each

<u>W</u>		<u>L</u>
32	x	44
40	x	48
44	x	48
45	x	48
44	x	54

8/6/97

Bob Du Fresne will call this afternoon.

Pictures

Before and after
Boxes
Spools

Schaffer 6-8 weeks Come from Germany

Seals
Cards

Levels could stay in egg crating if collapsed about 1/4" (little more) space
Capacity recommended load 50 lbs. each
Stack 10 high

8/7/97

Bob Du Fresne

Mike McGuire

44" x 54" pallet (500)	39.87 each
Bigelow 44 x 54 x 42 sleeves (250)	13.63 each

Opte - Pack quote good for 30 days - Sept. 6th order date

Side wall printing, \$500-\$1,000 per color (i.e., per plate) setup

Hot stamp, \$125, Die charge \$1 per hit

Centro, Rick Anderson

Check on plastic sleeves (outside storage)

Freight on way back

Truckload or partial load

Cindy, X1325

How many per truck - 90" across, 40' deep

480"

= 8 rows

7"/pallet	12 high 48
	13 high 10 rows
	17-- 11

Cindy: 48' trailer - 1 truckload

150 pallets at 14 lbs. each

75 sleeves at 24 lbs.

at X1,325

Check with Northstar and Clark Brothers

Bob Du Fresne

3" stopper down to and through pallet

27" spool

8/8/97

1:30 Tom's office Imperial

Rock Holms, Stone Container, (816) 238-3301
or John Dagenbardt

Imperial Custom Molding

10 - 18	1 - 1.25
20	1.78 - 2.00

Schaefer 3¼" collapsed

Orbis 10" collapsed

Schaefer pins breakable?

250 at a time

8/8/97

Steve called at 10 - 10:30 a.m.

Ask Dick about pallets coming back to Plant I.

Carbonless paper recycle? Yes.

Imperials List

I think that only parts with at least 1 box/month being returned to the system should be considered. I didn't include parts that have a small box size, but in new size, wouldn't return 1/month.

Total cu. in. new box = 5,280

10 = 1,000 ~ 5 old/new

12 = 2,744 ~ 3 old/new

16 = 4,096 ~ 1.3 old/new

18 = 5,832 ~ 1 old/new

20 = 8,000 ~ 2/3 old/1 new

For a total of 16 part numbers (totes could be a couple more, but boxes size confusing)

8/11/97

How many boxes/year = $817.1 = 818$

/mo. = $68.2 = 69(?)$

.4 = 276 boxes would be required

But if add up ~ per month = 103

.4 = 412

$3\frac{1}{2} = 360$

Pallet services isn't going to be able. Maybe check back in 2 months. They are losing employees to back-to-school.

Carriers

Northstar	\$450	Full truck only, i.e., not weight
Clark Bros.	\$174.40	by weight

8/12/97

Imperial

Round robin shipping costs (one a week - 10 days)

500 too many at once

Jim King, shipping guy (manager)

Independent Packaging Services

Jim Peterson will call later.

American Linen Supply

\$2.50 roll towels / depend on how many
\$.25 per week

Bob Marty: Can you recycle paper towels in restroom?

8/13/97

Bob Grey matter from drilling, 424-1354

Twin City Baler, 884-7906

Kurt Berendt

Looking at \$3,100 - \$3,200 delivered
42"

American Services (Olympic Balers) just do
Call back at 1:30 p.m.

8/14/97

Doug at ESS, 1-800-877-7028
FA container

Kurt T.C. Baler, 884-7906

650-4163 (pager)

Actually Tuesday, 19th, go visit in Eden Prairie, Todd King

Orbis

Hot stamp letters or die (charge)
card holders 4 x 8.3
Dave sending over quote

8/18/97

Fitting and feet with pump in each crating

36 per box 3 - 4 lbs.
(72 at 1 time)

Measure boxes

Gorman -Rupp

73260 similar to 79323
33326 heavier
222258
223496 Same, but different brackets
379001
379005

Met

33311 — low volume (?)
44939 —

Warner Von Wiese

They have similar sized parts

8/19/97

Jeff Haynes - He will be here tomorrow. Stop by in afternoon.

Davis Supplier

What if new boxes were 48L x 30W x 29H

Total/mo. Nov. 6
 3
 11
 7
 2
 30

But some not always full

12 x 4 = 48 = 55
4 x 4 = 16 = 20
11 x 4 = 44 = 50
10 x 4 = 40 = 45
3 x 4 = 12 = 20
40 x 4 = 160 Boxes = 190 Boxes

Problems to address:

Confusion on which boxes go back to where.

8/20/97

	<u>Fraction</u>	<u># Extra Sleeves</u>
Flojet	.1 (1/10)	14
Warner	.15 (3/20)	21
Von Wiese	.4 (2/5)	56
Gorman	.25 (1/4)	35
MET	.1 (1/10)	14

Extra sleeves = 140

Packaging Solutions

H. Moutopoulos

Shuert

Buy 200 sleeves

160 pallets and caps

So, extra sleeves = 40

Flojet 4
Warner 6

Von Wiese 16
Gorman 10
MET 4

Centro:

Change extra sleeves = 75
instead

Packaging Solutions Inc.
1940 S. Hillburt St.
Milwaukee, WI 53207

Aug. 21, 1997

Sternswood : Rick McArdle

32 x 44 OD
28-1/2 x 41-1/2 ID
160 units 40 extra
1100 lb. sleeve
8 clips @ \$0.50 each
call stone container about insides

Things to take pictures of:

paint guys in suits
suit collector
pallets
scrap wood
cardboard trailer
spools w/o brushes
spools w/ brushes
engineering rack
tubular brush boxes

APP

cardholders ~ 6 x 8 \$
stencils around box \$

Kurt Twin City Baler Left a message

Brushes

Drill: different brush backs
collection
change bag before start wooden backs

Jan Harding about warehouse section meeting

Aug. 22, 1997

Rick McArdle

units top & bottom: \$25.65 each 4 way entry
Sleeves: \$11.00 each
clips (8): \$0.50 each

\$66.30 total

Sleeves + clips: \$15.00 each for additional 40
freight costs also
Drop gate on 44" side may add up to \$1
can get sample

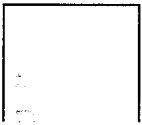
Kurt Twin City Baler
895-8811
asked about a 60", he will call back

Harry M. Packaging Solutions. called
no price on sleeve yet but will let me know

60" baler makes 1000 lb. bale of plastic

Garbage
\$1100 to show up trip charge
\$45/T disposal
\$40/ pick up assessment fee for compactor
sales tax
fed tax
\$104/month city fee
40 yard container

Davis
printing
talk to corrugated supplier for Von Weise & Warner



this piece leave look which one, 379001 &
379005 leave individual pieces

Duane gets Ohio Electric
John French manages this, corrugated person

Aug. 25, 1997

Mike M. got a sample of Orbis container
FA-2415-147AQ Gray Sample container
777-0965

Woldorf
pays New Hope facility \$10/T here A@ \$55/T (7/31) will they wrap all of Tennant into one rate
Dave Diemer: 641-4541 out of office until ~ 3pm
Where premium price comes from?

John French x1769 Thermoform

Aug. 26, 1997

Mike McGuire: Unidex samples still in works

Kurt Barrent: Twin City Baler

440

2 years old, \$6400 delivered & installed in St. Paul if want to see them

\$9265 new

220 3 phase extra heavy duty

5000 lb.

Tennant brings over electricity

American Services, Olympic Specialty made for heavy duty compaction

Aug. 27, 1997

See Tom R.

bring camera to Plt II & box

Jeff Haynes

Gray Brush Backs

low volume

talked to recycler, not interested

storage

How many brushes per year?

190,000

Which line best for prototype?

not his area

lead time

2 weeks (preference)

pulling staples from tubular boxes

boxes could look bad, staples & paint

customer appearance

palletizing adhesive

haven't tried it yet

Prototype/Spools

Special order

say something in comment box

Special routing by putting in a comment in.

It happens when orders are released they put in comment

Comment: brushes for assembly; don't carton

Routing would have a location would need to say move to assembly

Person from Plt I would do this the expediter

On spool unit quantity per spindle

To Jeff

part #'s for side sweep

account # for 2 spools (one time deal)

How sit?

Transportation?

Storage @ Plt I?

Rock-Tenn: Dave Diemer
OBM or yellow sheet
Official Board Market, Chicago
Went up to \$100 now
2-3 times per month

How many spools? (see excel sheet)
4 lines: 6400, 355/385, 6080, 8410 (not many/line run)
Assume 3 week turn around
1 pallet per line run & 1 line run = 1 week

Aug. 28, 1997

Imperial: 72 totes delivered / month

Ohio Electric
sound interested in reusable packaging
motors 30-45 lb. each
concept packaging: Shuert
40 x 48 x 30-1/4 high
50 motors per package
triple wall
split sleeve
Doing this w/ another
company, start in ~
1 month
\$1.25 per motor
Looking @ sharing cost w/ other company

Packaging Solutions
going to fax over prices

for a ball park estimate of \$ spent by Tennant on packaging for Duane Davis companies assume all parts
have a packaging cost of \$1.25 each
total parts = 25,013
spent = \$31,266

Aug. 29, 1997

Duane & I discussed yesterday that Tennant will pay for the box & each supplier should pay for their internal packaging. With this Duane will not be able to save the entire packaging cost. What fraction will be retained, if any, will need to be negotiated w/ each supplier. Tennant could save all packaging cost if Tennant pay for return shipment.

Ohio Electric parts weigh up to 45 lb. each so must worry about burst strength. If 30 fit in a box total weight = 1350 lb..

Harry M.: Left a message

Left a message for Bob Lucht to talk about putting spools on his line
Talk to Jim on 355 line before they are ordered
Talk to Rick (on Tuesday) about how to work this so that I can see the brushes when they come in.
Bob, Jim will need them late next week

Need to recalculate # extra sleeve to each company

Harry M. internal packaging:

\$800 per tooling per type of cut

\$20-30 per layer

Would be semi-permeate last 3-4 years

Mike called

Said: got message for quote for 800 35"W x 55"L pallets & 500 40"H sleeves. Hopefully get quote on Thursday

Sept. 2, 1997

Mike- sent in request of new size. quote expires 9/6/97. will request a sample of 35"W x 55"L x 40"H box
May be a price increase after quote expires.

Surface area of side sweep brush boxes = 2116 sq. in.

650 boxes = 7.4 million sq. in. = 51,200 sq. ft.

Surface area of tubular brush boxes = 398 sq. in.

total area = 1.33 million sq. in. = 13,557 sq. ft.

Surface area of new boxes = 14,872 sq. in.

60 boxes = 1.78 million sq. in. = 12,400 sq. ft.

Surface are APP boxes = 6624 sq. in.

395 boxes = 2.616 million sq. in. = 18,170 sq. ft.

Surface area for Centro boxes = 9196 sq. in.

total area = 35.864 million sq. in. = 249,000 sq. ft.

Du Fresne Mfg.

price of spools will stay the same, Bob gone Sept. 15 - 18

Surface are Duane Davis boxes = 4640 sq. in.

1050 boxes = 4.872 million sq. in. = 33,833 sq. ft.

Sept. 3, 1997

6080

Say 35/week or 140 boxes + 300 for 5700 = 440 boxes

TNV makes 1000 6080's & 1500 5700's per year

Stamps say property of Tennant Company

On side say: Model 5700

Model 6080

Tennant Oval

Change to 550 units for 5700 + 140 units for 6080 = 640 total units

Need to recalculate how often send boxes back to Centro.

in a 48" trailer get 2 columns of 10 each or 20 spaces

Walls have 4 times the wall thickness = $4 \times 0.6 = 2.4$ " / wall

30 walls per space (plus 2 pallets)

Each stacked pallet takes 1.5" = 46 pallets / space

30 walls per column * 9 columns = walls for 270 units

46 pallets per column * 11 columns = 506 pallets = for 253 units
So 250 units fit in a truck or every 3 weeks
Double = 500 + 10% extra = 550 units or 1100 pallets & 550 sleeves + 150 extra = 700 sleeves

Talk to Jim Lund about comment section for brushes
talk to Ruth about brushes

Quote requested from Dave @ ESS
1400 pallets
850 sleeves

Sept. 4, 1997

Unidex send samples tomorrow, get them Tues. or Wed.

Digital Pictures (in t drive in fac_ric)

#3: scrap wood	#4: pallets
#5: accuator box	#6: imperial box
#7: Parker hoses	#8: 355 brush holder
#9: rack	#10: side sweep brush
#11: tube brushes	#12: 6080 frame
#13: side brush box	#14: recycling plastic
#15: 60" baler	#16: 5700 box
#17: Tuff-Torq box, open	#18: Tuff-Torq together
#19: 5700 tank	#20: cardboard
#21: APP box	#22: Tyvek barrel
#23: tote	KP1: collapsed tote
KP2: 1 spool	KP3: paint guys
KP4: Tennant Rack w/ parts	KP5: 2 spools

Mike Hill @ Gorman-Rupp (419) 886-5243 ph (419) 886-2338 fax
Says returnable packaging sounds good
They are in Belvile, OH

Fran
Brochures
Mention Ken Brown

Quantity Paper Tubing in Osseo 428-8588
Shelly
2" OD
27" long
1/4" gage
100 = \$1 each
250 = \$0.64 each
500 = \$0.52 each
Lead time = 1 week

Mike
Orbis sample shipped yesterday, should be there by Tuesday, call if not

Flojet charges \$0.1552 per pump for packaging

Sept. 9, 1997

Nelson Head
Flojet sales manger
1-800-235-6538

Rebecca Risoya Tyvek Recycling

(219)865-4848

Suits disintegrated during process because not coated, but are polypropylene
I asked for price list of cleaned garments

In abstract want cardboard in lb..

piece = 2oz.

area = 10.09 sq. in = 0.0701 sq. ft.

or 0.178 lb./sq. ft.

Surface area Pawnee boxes = 9472 sq. in.

1680 boxes = 15.912 million sq. in. = 110,507 sq. ft. = 19,670 lb. = 9.84 tons

Left a message for Nelson Head, Flojet

Wt. of bags = 0.311 lb. each = 1119.6 lb./year = 0.56 tons/year

Sept. 12, 1997

Rick renegotiated prices of parts & work out shipping loop

no extra sleeves (Jeff Fliss)

Issues w/ Centro:

they pay freight one way/both ways

Trailer belongs to Clark Bros.

Put a trailer outside for storage at \$100/month?

APPENDIX A: PARTS LIST

Appendix A: Parts Inventory

Part #	Description	Packaging	Manufacturer	Mfg. Location	Quantity	Controller	Purchasing	Notes	Status
01951	actuator	box w/ dividers	Warner		388	Debby Woodfill	Lorrie Dahl	candidate for reusable black box	
02063	radiator tube	box	RAO Manufacturing		240	Curt Lange	Rich Carlson		
02549	Black hose (1/4" thick)	box	Parker		309	Curt Lange	Rich Carlson		
05127	hose	box	no Pur I/M		1,805	Patty Otten	Lorrie Dahl		
05216	hose	box	Midwest Rubber		1,239	Patty Otten	Lorrie Dahl		
08012	Brush back		Carris Reels		6,750	Patty Otten	WL		
08911	Plastic cover	box, plastic bag	Thermoform Plastics	White Bear Lake, MN	901	Patty Otten	John French		
09027	Tires	shrink wrap, level dividers	Ace Products		829	Curt Lange	John French		
10136	Batteries	box	Trojan Battery Company	Lithuania, GA	256	Patty Otten	Lauri Jorgenson		
10143	Battery	box	Trojan Battery Company	Lithuania, GA	728	Patty Otten	Lauri Jorgenson		
14142	Plastic white covers	box	Thermoform Plastics	White Bear Lake, MN	53	Patty Otten	Lorrie Dahl		
14444	Plastic cover	box, plastic bag	Thermoform Plastics	White Bear Lake, MN	617	Patty Otten	John French		
14880	Clear plastic cap	box	Imperial Custom Molding	Rogers, MN	4,933	Kwami Ahelegbe	Tom Runyon		
16202	Black cylinders, round disc	box	Elastomer		617	Debby Woodfill	Lauri Jorgenson		
16224	motor	box w/ dividers	Ohio Electric		1,834	Kwami Ahelegbe	Duane Davis	candidate for reusable black box	
16462	Black hose (1/2" thick)	box	Parker		340	Curt Lange	Rich Carlson		
16903	Sq. foam pads, donut like	box	Applied Power Products	Lakeville, MN	638	Patty Otten	Jane Angell		
16909	White hose	box	Midwest Rubber		381	Patty Otten	Jane Angell		
16917	Gray hose	box	MN Flex		842	Patty Otten	Jane Angell		
17128	pump	box w/ dividers	Flojet		399	Debby Woodfill	Duane Davis	candidate for reusable black box	
17191	Battery Tray	box	Thermoform Plastics	White Bear Lake, MN	595	Patty Otten	John French		
19644	Black tube (1/4" thick)	box	Parker		2,639	Curt Lange	Rich Carlson		
20971	hose	box	Midwest Rubber		705	Patty Otten	Jane Angell		
23456	Clear plastic nuts	box	Imperial Custom Molding	Rogers, MN	3,843	Kwami Ahelegbe	Tom Runyon		
24928-1	gas tank	string w/ plastic web	Mancheaster Tank		600	Curt Lange	John French	go back to cardboard protectors?	
25649	Short clear hose, opaque string through it	box	Midwest Rubber		484	Patty Otten	Jane Angell		
28546	Tires	shrink wrap, level dividers	Ace-Ohio		1,232	Curt Lange	John French		
31517	Black hose	box	Gates Rubber Company	Polar Bluff, MO	1,132	Debby Woodfill	Jane Angell		
31610	Long black hose (3/4" thick)	box	Parker		574	Curt Lange	Rich Carlson		
31611	Short black hose (1" thick)	box	Parker		76	Curt Lange	Rich Carlson		
31999	motor	box w/ dividers	Mel		569	Debby Woodfill	Duane Davis	candidate for reusable black box	
32477	Black hose	box	Orscheln		242	Diana Meyer	Jane Angell		
35488	Black hose (1" thick)	box	Parker		1,016	Curt Lange	Rich Carlson		
36146	hose	box	Parker		320				
41678	belt	box	Gates (Goodyear-VB)		1,003	Debby Woodfill	Lauri Jorgenson		
41878	Brush back		Carris Reels		2,160	Patty Otten	WL		
43516A	soap basket	box, level dividers	Filtertek		1,017	Kwami Ahelegbe	Tom Runyon		
44255	Black hose	box	Midwest Rubber		1,755	Patty Otten	Jane Angell		
45962	Plastic eliptical clear pieces	box	Imperial Custom Molding	Rogers, MN	58,611	Kwami Ahelegbe	Tom Runyon		
47069	2 Foam pieces, donut like	box	Midwest Rubber		1,210	Patty Otten	Jane Angell		
47525	tire	shrink wrap w/ cardboard dividers	Ace Products	Carlisle, PA	522	Curt Lange	Lorrie Dahl		
48751	valve	box w/ dividers	Eaton-Hyd		193	Debby Woodfill	Duane Davis	candidate for reusable black box	
49943	Short black hose (1/2" thick)	box	Parker		1,085	Curt Lange	Rich Carlson		
50817	radiator tube	box	Shroud Welding MT		64				
51090	seal, pan side	box	Applied Power Products Inc.	Lakeville, MN	234	Patty Otten	Lorrie Dahl		
52238	spring	box	Midwest Spring		2,277	Randy Skogman	Lauri Jorgenson	hard to count if too big of box	
53485	motor	box w/ dividers	Barnes JS		1,216	Debby Woodfill	Duane Davis	candidate for reusable black box	
53554	hydraulic pump	box w/ dividers	Eaton-Hyd		624	Debby Woodfill	Duane Davis	candidate for reusable black box	
53817	Tires	shrink wrap, level dividers	Ind. Tire Sal.		531	Curt Lange	John French		
53883	plastic tube	box	Seelye Plastic		200	Curt Lange	Lauri Jorgenson	also used for service	

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54121	actuator	box w/ dividers	Met		3,141	Debby Woodfill	Duane Davis	candidate for reusable black box
54342	plastic cover	box, plastic bag, foam sheets	Thermoform Plastocs	White Bear Lake, MN	1,153	Patty Otten	John French	
54437	Tires	shrink wrap, level dividers	Unknown		3,925			
54930	vaporizer	box w/ dividers	Impco Carb.		719	Kwami Ahelegbe	Rich Carlson	candidate for reusable black box
55416	Black rubber piece	box	Applied Power Products	Lakeville, MN	1,061	Patty Otten	Lorrie Dahl	
56398	steering wheel	big box w/ plastic bag around each wheel	TEI Group		3,258	Randy Skogman	John French	
56465	muffler	box, level dividers	Nelson		273	Kwami Ahelegbe	John French	candidate for reusable black box
57499	steering wheel	big box	West American		318	Randy Skogman	Duane Davis	
57935	steering gear	box w/ dividers	Eaton-Hyd		1,216	Debby Woodfill	Duane Davis	candidate for reusable black box
57962	1/4" thick tube	box	Parker		1,135	Curt Lange	Rich Carlson	
57963	Long black tube (1/2" thick)	box	Parker		1,867	Curt Lange	Rich Carlson	
57964	Black hose (1/4" thick)	box	Parker		6,080	Curt Lange	Rich Carlson	
58524	headlight	box w/ dividers	Hobbs Corp.		4,170	Randy Skogman	Lauri Jorgenson	candidate for reusable black box
59106	Black hose (1" thick) curved on one end	box	Parker		583	Curt Lange	Rich Carlson	
59303	Black hose (1" thick) curved on one end	box	Parker		507	Curt Lange	Rich Carlson	
59560	Black hose	box	Parker		640	Curt Lange	Rich Carlson	
59574	Black hose (3/4" thick)	box	Parker		91	Curt Lange	Lorrie Dahl	
59575	Black hose, copper curve on one end	box	Parker		91	Curt Lange	Rich Carlson	
59584	Short black hose (1/4" thick)	box	Parker		520	Curt Lange	Rich Carlson	
59585	Black hose (1/4" thick)	box	Parker		594	Curt Lange	Rich Carlson	
59666	leg	Gaylord boxes	Bauer Welding Metal Fab.		574	Kwami Ahelegbe		
59881	hose/belt	box	Gates		1,151	Debby Woodfill	Lauri Jorgenson	
60395	Tires	shrink wrap, level dividers	Unknown		576			
63276	Green hose	box	Cuthill Corp. Cable Craft Div.	St. Matthews, SC	317	Diana Meyer	Jane Angell	
63294	seat	box, plastic bag	Seats Inc.		291	Randy Skogman	Rich Carlson	
63297	filters	boxes	Donaldson		2,074	Curt Lange	Lorrie Dahl	
64317	hose	box	Midwest Rubber		972	Patty Otten	Jane Angell	
64320	hose	box	Midwest Rubber		2,982	Patty Otten	Tom Runyon	
65199	Black hose (1" thick)	box	Parker		289	Curt Lange	Rich Carlson	
65201	Black hose (1" thick)	box	Parker		654	Curt Lange	Rich Carlson	
65204	Black hose (1/2" thick)	box	Parker		289	Curt Lange	Rich Carlson	
65340	cover for rubber strips	shrink wrap			559	Patty Otten		from Holland, MI plant
69657	hose	box	unknown		168		Duane Davis	
69986	Rectangular small foam	box	Applied Power Products	Lakeville, MN	1,122	Patty Otten	Jane Angell	
70278	Tires	shrink wrap, level dividers	Ind. Tire Sal.		92	Curt Lange	John French	
70287	Tires	shrink wrap, level dividers	Unknown		1,273	Curt Lange	John French	
70288	Tires	shrink wrap, level dividers	Ind. Tire Sal.		521	Curt Lange	John French	
71719	pump	box w/ dividers	Barnes JS		593	Debby Woodfill	Jane Angell	candidate for reusable black box
71916	Curved hose	box	Gates Rubber Company	Polar Bluff, MO	606	Debby Woodfill	Lauri Jorgenson	
72070	Black rubber	box	Applied Power Products	Lakeville, MN	833	Patty Otten	Lorrie Dahl	
72159	washer	box	Minneapolis Washer	Minneapolis, MN	8,383	Curt Lange	Jane Angell	
72824	Square foam pads	box	Applied Power Products	Lakeville, MN	1,667	Patty Otten	Jane Angell	
72991	tank	box, plastic bags, foam sheets	Centro	Iowa	346	Cindy Scheevel	Lorrie Dahl	
73030	muffler	box w/ dividers, plastic bag	Nelson		109	Kwami Ahelegbe	Lauri Jorgenson	candidate for reusable black box
73282	radiator tube	box	Linfor		54	Kwami Ahelegbe	Duane Davis	
73283	radiator tube	box	Bauer Welding		54	Kwami Ahelegbe	John French	
74063	Small foam pads	box	Applied Power Products	Lakeville, MN	391	Patty Otten	Jane Angell	
74163	motor	box w/ dividers	Eaton		348	Debby Woodfill	Duane Davis	candidate for reusable black box
74486	window kit	wooden box, not many to a box	TPI		135	Kwami Ahelegbe	John French	could we return box?
75635	nozzle	box	MN Flex		765	Patty Otten	Jane Angell	

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75866	shroud, fan	box	VEE Engineering		132	Kwami Ahelegbe	Tom Runyon	
76383	muffler	box w/ dividers	Nelson		302	Kwami Ahelegbe	Lauri Jorgenson	candidate for reusable black box
76867	Rectangular foam pad	box	Unknown		72	Patty Otten	Jane Angell	
77235	seat	box, plastic bag	Michigan Seat	Jackson, MI	944	Randy Skogman	John French	
77235	Black seats	box	Michigan Seat Company	Jackson, MI	947	Randy Skogman	Lauri Jorgenson	
77301	Black tube (3/4" thick)	box	Parker		13	Curt Lange	Lorrie Dahl	
77303	Long black tube (1/4" thick)	box	Parker		327	Curt Lange	Rich Carlson	
77304	Short black tube (1/2" thick)	box	Parker		340	Curt Lange	Rich Carlson	
77305	Short black hose (1/4" thick)	box	Parker		327	Curt Lange	Rich Carlson	
77306	Long black tube (1/4" thick)	box	Parker		1,247	Curt Lange	Rich Carlson	
77311	Black hose (1/4" thick)	box	Parker		327	Curt Lange	Rich Carlson	
77315	Black hose (1/2" thick)	box	Parker		340	Curt Lange	Rich Carlson	
77316	Short black hose (1" thick)	box	Parker		340	Curt Lange	Rich Carlson	
77337	Long black hose (1/2" thick)	box	Parker		340	Curt Lange	Rich Carlson	
77338	Black hose (1/2" thick)	box	Parker		327	Curt Lange	Rich Carlson	
77602	Batteries	box	Trojan Battery Company	Lithuania, GA	246	Patty Otten	Lauri Jorgenson	
77790	break shoe assembly	box	Knott Break		360	Debby Woodfill	John French	
78012	Large foam pad	box	Applied Power Products	Lakeville, MN	66	Patty Otten	Jane Angell	
78013	U-shaped foam pad	box	Applied Power Products	Lakeville, MN	23	Patty Otten	Jane Angell	
78014	Large square foam pad	box	Applied Power Products	Lakeville, MN	23	Patty Otten	Jane Angell	
78777	Black tube (1-1/2" thick)	box	Parker		327	Curt Lange	Rich Carlson	
78780	Short black hose (1" thick)	box	Parker		327	Curt Lange	Rich Carlson	
78810	Long black hose (1/2" thick)	box	Parker		340	Curt Lange	Rich Carlson	
79323	pump	box w/ dividers	Gorman Ripp		240	Debby Woodfill	Duane Davis	candidate for reusable black box
79326	pump	box w/ dividers	Flojet		263	Debby Woodfill	Duane Davis	candidate for reusable black box
80022	differential	box w/ dividers	Tecumseh		1,826	Debby Woodfill	John French	candidate for reusable black box
80028	caster	box	Darcar		3,715	Randy Skogman	John French	
80043	Brush back		Imperial Custom Molding	Rogers, MN	3,600	Kwami Ahelegbe	Tom Runyon	
80047	brush arm	box	Imperial Custom Molding	Rogers, MN	1,851	Kwami Ahelegbe	Tom Runyon	
80063	Batteries	box	Trojan Battery Company	Lithuania, GA	734	Patty Otten	Lauri Jorgenson	
80087	Battery	box	Trojan Battery Company	Lithuania, GA	240	Patty Otten	Lauri Jorgenson	
80148	tire	shrink wrap , cardboard level dividers	Gleason		3,676	Curt Lange	Rick Anderson	
80320	Gray disc ,fins on it	box	Imperial Custom Molding	Rogers, MN	1,865	Kwami Ahelegbe	Tom Runyon	
80414	Black plastic, pie-shaped	box	Imperial Custom Molding	Rogers, MN	1,899	Kwami Ahelegbe	Tom Runyon	
80424	brush arm	box	Imperial Custom Molding	Rogers, MN	1,788	Kwami Ahelegbe	Duane Davis	
80427	nozzle	box	Pawnee		1,825	Cindy Scheevel	John French	
80461	pump	box w/ dividers	Met		320	Debby Woodfill	John French	candidate for reusable black box
80465	hubcap	box	Imperial Custom Molding	Rogers, MN	3,650	Kwami Ahelegbe	Lauri Jorgenson	
80468	Plastic cover	box, plastic bag	Thermoform Plastics	White Bear Lake, MN	294	Patty Otten	John French	
80469	plastic piece	box, plastic bag, foam sheets	Thermoform Plastics	White Bear Lake, MN	398	Patty Otten	Duane Davis	
80470	Plastic cover	box	Thermoform Plastics	White Bear Lake, MN	1,202	Patty Otten	John French	
82342	seat	box, plastic bag	Michigan Seat	Jackson, MI	266	Randy Skogman	Jane Angell	
82826	Black hose (1" thick)	box	Parker		360	Curt Lange	Rich Carlson	
84005	muffler	box w/ dividers	Nelson		345	Kwami Ahelegbe	Jane Angell	candidate for reusable black box
84144	Black tube (10 mm thick)	box	Parker		51	Curt Lange	Rich Carlson	
86076	Black plastic	box	Imperial Custom Molding	Rogers, MN	140	Kwami Ahelegbe	Tom Runyon	
86141	motor	box w/ dividers	Peerless		231	Debby Woodfill	Tom Runyon	candidate for reusable black box
86926	tank gasket	box	Precision GA (Applied ?)		234	Patty Otten	Tom Runyon	
87196	Tires	shrink wrap, level dividers	Unknown		26			
87421	Tires	shrink wrap, level dividers	Dico		198	Curt Lange	John French	
87432	Tires	shrink wrap, level dividers	Dico		130	Curt Lange	John French	
87673	wire sleeve	many boxes	Arden Fast		2,421	Curt Lange	Jane Angell	
87681	Black tube (1/4" thick)	box	Parker		342	Curt Lange	Rich Carlson	
87689	Black hose	box	Lakeview Ind.		1,099	Kwami Ahelegbe	Tom Runyon	

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222092	steering housing	shrink wrap, corners	Imperial Custom Molding	Rogers, MN	3,033	Kwami Ahelegbe			
222093	steering housing	shrink wrap, corners	Imperial Custom Molding	Rogers, MN	1,469	Kwami Ahelegbe			
222121	tank gasket	box, cardboard level dividers	Applied Power Products	Lakeville, MN	4,781	Patty Otten	Jane Angell		
222161	casting	shrink wrap	Plant II		258		Tom Runyon	come into plant II	
222165	casting	shrink wrap	Plant II		86		Duane Davis	come into plant II	
222180	red rubber squeegee	box	Midwest Rubber		14,786	Patty Otten	Jane Angell		
222244	plastic piece	box, level dividers	Imperial Custom Molding	Rogers, MN	11,249	Kwami Ahelegbe	Tom Runyon		
222353	pump	box, w/ dividers	Flojet		1,643	Debby Woodfill	Duane Davis	canidate for reusable black box	
222379	hose	box	Midwest Rubber		5,174	Kwami Ahelegbe	Jane Angell		
222748	steering shroud	shrink wrap, corners	Imperial Custom Molding	Rogers, MN	5,088	Kwami Ahelegbe	Tom Runyon		
222810	hose	box	Midwest Rubber		127	Patty Otten	Jane Angell		
222835	harness, wire, cylinder head	box	Fargo Assembly	Norristown, PA	2,533	Randy Skogman	Rich Carlson		
222836	harness, wire, disk head	box	Fargo Assembly	Norristown, PA	2,816	Randy Skogman	Rich Carlson		
222837	harness, wire, disk head	box	Fargo Assembly	Norristown, PA	487	Randy Skogman	Rich Carlson		
222846	Batteries	box	Trojan Battery Company	Lithuania, GA	7,296	Patty Otten	Lauri Jorgenson		
222847	Batteries	box	Trojan Battery Company	Lithuania, GA	1,287	Patty Otten	Lauri Jorgenson		
222857	harness, main	box	Electrical Wire Prod.	Minneapolis, MN	2,966	Randy Skogman	Rich Carlson		
223053	switch	box w/ dividers	Curtis Instruments		641	Randy Skogman	Duane Davis	canidate for reusable black box	
223077	seat	box, plastic bag	Michigan Seat	Jackson, MI	884	Randy Skogman	Lauri Jorgenson		
223573	casting	shrink wrap	Plant II		778			come into plant II	
223681	Unknown	box	Motor App.		373	Patty Otten	Lauri Jorgenson		
360071	Tires	shrink wrap, level dividers	Unknown		1,623	Curt Lange	John French		
360175	motor	box w/ dividers	Advanced DC		280	Debby Woodfill	Duane Davis	canidate for reusable black box	
360351	muffler	box	Nelson		248	Kwami Ahelegbe	Rick Anderson	lots around, good possible canidate	
360366	Black metal hose	box	Unknown		277				
360370	wire sleeve	many boxes	DekDuct		104	Curt Lange	Lauri Jorgenson		
360384	engine	box, used to be metal racks	Kohler		105	Kwami Ahelegbe	Rick Anderson	why change?	
360442	Black hose	box	Cablecraft		444	Diana Meyer	Jane Angell		
360769	Tires	shrink wrap, level dividers	Ind. Tire Sal.		450				
361034	Black hose (1/4" thick)	box	Parker		250	Curt Lange	Rich Carlson		
361036	Black hose, curve on one end	box	Parker		500	Curt Lange	Rich Carlson		
361044	Short black hose (1/4" thick)	box	Cablecraft		444	Diana Meyer	Jane Angell		
361046	Black hose	box	Parker		552	Curt Lange	Rich Carlson		
361069	Tires	shrink wrap, level dividers	Ind. Tire Sal.		102	Curt Lange	Lorrie Dahl		
363152	actuator	box w/ dividers	Warner		612	Debby Woodfill	Duane Davis	canidate for reusable black box	
363619	pump	box w/ dividers	Barnes JS		183	Debby Woodfill	Duane Davis	canidate for reusable black box	
363621	actuator	box w/ dividers	Von Wiese		556	Debby Woodfill	Duane Davis	canidate for reusable black box	
370100	4 prong knob	box	OEP	Wheeling, IL	31,019	Curt Lange	Lauri Jorgenson		
C460165	Kuritec hose	wrapped in plastic	Midwest Rubber		22,177	Patty Otten	Jane Angell		
NOTE: ONLY PARTS THAT ARE USED IN ASSEMBLY WERE USED IN THIS LIST BECAUSE THEY PROVIDE THE BEST OPPORTUNITY TO REDUCE SOURCE WASTE.									
ALSO, SOME PARTS THAT ARE OBSOLETE,OR SOON TO BE, WERE OMITTED.									
LAST UP-DATED 7/10/97 12:40 PM									

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Appendix A: Parts Inventory

Part #	Description	Packaging	Manufacturer	Mfg. Location	Quantity	Controller	Purchasing	Notes	Status
45962	Plastic elliptical clear pieces	box	Imperial Custom Molding	Rogers, MN	58,611	Kwami Ahelegbe	Tom Runyon		
370100	4 prong knob	box	OEP	Wheeling, IL	31,019	Curt Lange	Lauri Jorgenson		
C460165	Kuritec hose	wrapped in plastic	Midwest Rubber		22,177	Patty Otten	Jane Angell		
222180	red rubber squeegee	box	Midwest Rubber		14,786	Patty Otten	Jane Angell		
222244	plastic piece	box, level dividers	Imperial Custom Molding	Rogers, MN	11,249	Kwami Ahelegbe	Tom Runyon		
72159	washer	box	Minneapolis Washer	Minneapolis, MN	8,383	Curt Lange	Jane Angell		
222846	Batteries	box	Trojan Battery Company	Lithuania, GA	7,296	Patty Otten	Lauri Jorgenson		
08012	Brush back		Carris Reels		6,750	Patty Otten	WL		
57964	Black hose (1/4" thick)	box	Parker		6,080	Curt Lange	Rich Carlson		
222379	hose	box	Midwest Rubber		5,174	Kwami Ahelegbe	Jane Angell		
222748	steering shroud	shrink wrap, corners	Imperial Custom Molding	Rogers, MN	5,088	Kwami Ahelegbe	Tom Runyon		
14880	Clear plastic cap	box	Imperial Custom Molding	Rogers, MN	4,933	Kwami Ahelegbe	Tom Runyon		
222121	tank gasket	box, cardboard level dividers	Applied Power Products	Lakeville, MN	4,781	Patty Otten	Jane Angell		
58524	headlight	box w/ dividers	Hobbs Corp.		4,170	Randy Skogman	Lauri Jorgenson	candidate for reusable black box	
54437	Tires	shrink wrap, level dividers	Unknown		3,925				
23456	Clear plastic nuts	box	Imperial Custom Molding	Rogers, MN	3,843	Kwami Ahelegbe	Tom Runyon		
80028	caster	box	Darcar		3,715	Randy Skogman	John French		
80148	tire	shrink wrap , cardboard level dividers	Cleason		3,676	Curt Lange	Rick Anderson		
80465	hubcap	box	Imperial Custom Molding	Rogers, MN	3,650	Kwami Ahelegbe	Lauri Jorgenson		
80043	Brush back		Imperial Custom Molding	Rogers, MN	3,600	Kwami Ahelegbe	Tom Runyon		
56398	steering wheel	big box w/ plastic bag around each wheel	TEI Group		3,258	Randy Skogman	John French		
54121	actuator	box w/ dividers	Met		3,141	Debby Woodfill	Duane Davis	candidate for reusable black box	
222092	steering housing	shrink wrap, corners	Imperial Custom Molding	Rogers, MN	3,033	Kwami Ahelegbe			
64320	hose	box	Midwest Rubber		2,982	Patty Otten	Tom Runyon		
222857	harness, main	box	Electrical Wire Prod.	Minneapolis, MN	2,966	Randy Skogman	Rich Carlson		
222836	harness, wire, disk head	box	Fargo Assembly	Norristown, PA	2,816	Randy Skogman	Rich Carlson		
19644	Black tube (1/4" thick)	box	Parker		2,639	Curt Lange	Rich Carlson		
222835	harness, wire, cylinder head	box	Fargo Assembly	Norristown, PA	2,533	Randy Skogman	Rich Carlson		
87673	wire sleeve	many boxes	Arden Fast		2,421	Curt Lange	Jane Angell		
52238	spring	box	Midwest Spring		2,277	Randy Skogman	Lauri Jorgenson	hard to count if too big of box	
41878	Brush back		Carris Reels		2,160	Patty Otten	WL		
63297	filters	boxes	Donaldson		2,074	Curt Lange	Lorrie Dahl		
80414	Black plastic, pie-shaped	box	Imperial Custom Molding	Rogers, MN	1,899	Kwami Ahelegbe	Tom Runyon		
80047	Black plastic, big hole in it	box	Imperial Custom Molding	Rogers, MN	1,876	Kwami Ahelegbe	Tom Runyon		
57963	Long black tube (1/2" thick)	box	Parker		1,867	Curt Lange	Rich Carlson		
80320	Gray disc , fins on it	box	Imperial Custom Molding	Rogers, MN	1,865	Kwami Ahelegbe	Tom Runyon		
80047	brush arm	box	Imperial Custom Molding	Rogers, MN	1,851	Kwami Ahelegbe	Tom Runyon		
16224	motor	box w/ dividers	Ohio Electric		1,834	Kwami Ahelegbe	Duane Davis	candidate for reusable black box	
80022	differential	box w/ dividers	Tecumseh		1,826	Debby Woodfill	John French	candidate for reusable black box	
80427	nozzle	box	Pawnee		1,825	Cindy Scheevel	John French		
80424	Circular, holes in middle	box	Imperial Custom Molding	Rogers, MN	1,813	Kwami Ahelegbe	Tom Runyon		
05127	hose	box	no Pur I/M		1,805	Patty Otten	Lorrie Dahl		
80424	brush arm	box	Imperial Custom Molding	Rogers, MN	1,788	Kwami Ahelegbe	Duane Davis		
44255	Black hose	box	Midwest Rubber		1,755	Patty Otten	Jane Angell		
72824	Square foam pads	box	Applied Power Products	Lakeville, MN	1,667	Patty Otten	Jane Angell		
222353	pump	box, w/ dividers	Flojet		1,643	Debby Woodfill	Duane Davis	candidate for reusable black box	
360071	Tires	shrink wrap, level dividers	Unknown		1,623	Curt Lange	John French		
222093	steering housing	shrink wrap, corners	Imperial Custom Molding	Rogers, MN	1,469	Kwami Ahelegbe			
222847	Batteries	box	Trojan Battery Company	Lithuania, GA	1,287	Patty Otten	Lauri Jorgenson		
70287	Tires	shrink wrap, level dividers	Unknown		1,273	Curt Lange	John French		
77306	Long black tube (1/4" thick)	box	Parker		1,247	Curt Lange	Rich Carlson		
05216	hose	box	Midwest Rubber		1,239	Patty Otten	Lorrie Dahl		
28546	Tires	shrink wrap, level dividers	Ace-Ohio		1,232	Curt Lange	John French		
53485	motor	box w/ dividers	Barnes JS		1,216	Debby Woodfill	Duane Davis	candidate for reusable black box	

Sorted by Quantity

Appendix A: Parts Inventory

57935	steering gear	box w/ dividers	Eaton-Hyd		1,216	Debby Woodfill	Duane Davis	canidate for reusable black box	
47069	2 Foam pieces, donut like	box	Midwest Rubber		1,210	Patty Otten	Jane Angell		
80470	Plastic cover	box, plastic bag	Thermoform Plastics	White Bear Lake, MN	1,202	Patty Otten	John French		
54342	plastic cover	box, plastic bag, foam sheets	Thermoform Plastocs	White Bear Lake, MN	1,153	Patty Otten	John French		
59881	hose/belt	box	Gates		1,151	Debby Woodfill	Lauri Jorgenson		
57962	1/4" thick tube	box	Parker		1,135	Curt Lange	Rich Carlson		
31517	Black hose	box	Gates Rubber Company	Polar Bluff, MO	1,132	Debby Woodfill	Jane Angell		
69986	Rectangular small foam	box	Applied Power Products	Lakeville, MN	1,122	Patty Otten	Jane Angell		
87689	Black hose	box	Lakeview Ind.		1,099	Kwami Ahelegbe	Tom Runyon		
49943	Short black hose (1/2" thick)	box	Parker		1,085	Curt Lange	Rich Carlson		
55416	Black rubber piece	box	Applied Power Products	Lakeville, MN	1,061	Patty Otten	Lorrie Dahl		
43516A	soap basket	box, level dividers	Filtertek		1,017	Kwami Ahelegbe	Tom Runyon		
35488	Black hose (1" thick)	box	Parker		1,016	Curt Lange	Rich Carlson		
41678	belt	box	Gates (Goodyear-VB)		1,003	Debby Woodfill	Lauri Jorgenson		
64317	hose	box	Midwest Rubber		972	Patty Otten	Jane Angell		
77235	Black seats	box	Michigan Seat Company	Jackson, MI	947	Randy Skogman	Lauri Jorgenson		
77235	seat	box, plastic bag	Michigan Seat	Jackson, MI	944	Randy Skogman	John French		
08911	Plastic cover	box, plastic bag	Thermoform Plastics	White Bear Lake, MN	901	Patty Otten	John French		
223077	seat	box, plastic bag	Michigan Seat	Jackson, MI	884	Randy Skogman	Lauri Jorgenson		
16917	Gray hose	box	MN Flex		842	Patty Otten	Jane Angell		
72070	Black rubber	box	Applied Power Products	Lakeville, MN	833	Patty Otten	Lorrie Dahl		
09027	Tires	shrink wrap, level dividers	Ace Products		829	Curt Lange	John French		
223573	casting	shrink wrap	Plant II		778			come into plant II	
75635	nozzle	box	MN Flex		765	Patty Otten	Jane Angell		
80063	Batteries	box	Trojan Battery Company	Lithuania, GA	734	Patty Otten	Lauri Jorgenson		
10143	Battery	box	Trojan Battery Company	Lithuania, GA	728	Patty Otten	Lauri Jorgenson		
54930	vaporizer	box w/ dividers	Impco Carb.		719	Kwami Ahelegbe	Rich Carlson	canidate for reusable black box	
20971	hose	box	Midwest Rubber		705	Patty Otten	Jane Angell		
65201	Black hose (1" thick)	box	Parker		654	Curt Lange	Rich Carlson		
223053	switch	box w/ dividers	Curtis Instruments		641	Randy Skogman	Duane Davis	canidate for reusable black box	
59560	Black hose	box	Parker		640	Curt Lange	Rich Carlson		
16903	Sq. foam pads, donut like	box	Applied Power Products	Lakeville, MN	638	Patty Otten	Jane Angell		
53554	hydraulic pump	box w/ dividers	Eaton-Hyd		624	Debby Woodfill	Duane Davis	canidate for reusable black box	
16202	Black cylinders a round disc	box	Elastomer		617	Debby Woodfill	Lauri Jorgenson		
14444	Plastic cover	box, plastic bag	Thermoform Plastics	White Bear Lake, MN	617	Patty Otten	John French		
363152	actuator	box w/ dividers	Warner		612	Debby Woodfill	Duane Davis	canidate for reusable black box	
71916	Curved hose	box	Gates Rubber Company	Polar Bluff, MO	606	Debby Woodfill	Lauri Jorgenson		
24928-1	gas tank	string w/ plastic web	Mancheaster Tank		600	Curt Lange	John French	go back to cardboard protectors?	
17191	Battery Tray	box	Thermoform Plastics	White Bear Lake, MN	595	Patty Otten	John French		
59585	Black hose (1/4" thick)	box	Parker		594	Curt Lange	Rich Carlson		
71719	pump	box w/ dividers	Barnes JS		593	Debby Woodfill	Jane Angell	canidate for reusable black box	
59106	Black hose (1" thick) curved on one end	box	Parker		583	Curt Lange	Rich Carlson		
60395	Tires	shrink wrap, level dividers	Unknown		576				
59666	leg	Gaylord boxes	Bauer Welding Metal Fab.		574	Kwami Ahelegbe			
31610	Long black hose (3/4" thick)	box	Parker		574	Curt Lange	Rich Carlson		
31999	motor	box w/ dividers	Met		569	Debby Woodfill	Duane Davis	canidate for reusable black box	
65340	cover for rubber strips	shrink wrap			559	Patty Otten		from Holland, MI plant	
363621	actuator	box w/ dividers	Von Wiese		556	Debby Woodfill	Duane Davis	canidate for reusable black box	
361046	Black hose	box	Parker		552	Curt Lange	Rich Carlson		
53817	Tires	shrink wrap, level dividers	Ind. Tire Sal.		531	Curt Lange	John French		
47525	tire	shrink wrap w/ cardboard dividers	Ace Products	Carlisle, PA	522	Curt Lange	Lorrie Dahl		
70288	Tires	shrink wrap, level dividers	Ind. Tire Sal.		521	Curt Lange	John French		

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Appendix A: Parts Inventory

59584	Short black hose (1/4" thick)	box	Parker		520	Curt Lange	Rich Carlson		
59303	Black hose (1" thick) curved on one end	box	Parker		507	Curt Lange	Rich Carlson		
361036	Black hose, curve on one end	box	Parker		500	Curt Lange	Rich Carlson		
222837	harness, wire, disk head	box	Fargo Assembly	Norristown, PA	487	Randy Skogman	Rich Carlson		
25649	Short clear hose, opaque string through it	box	Midwest Rubber		484	Patty Otten	Jane Angell		
360769	Tires	shrink wrap, level dividers	Ind. Tire Sal.		450				
361044	Short black hose (1/4" thick)	box	Cablecraft		444	Diana Meyer	Jane Angell		
360442	Black hose	box	Cablecraft		444	Diana Meyer	Jane Angell		
360442	hose	box	Parker		443	Diana Meyer	Jane Angell		
17128	pump	box w/ dividers	Flojet		399	Debby Woodfill	Duane Davis	candidate for reusable black box	
80469	plastic piece	box, plastic bag, foam sheets	Thermoform Plastics	White Bear Lake, MN	398	Patty Otten	Duane Davis		
74063	Small foam pads	box	Applied Power Products	Lakeville, MN	391	Patty Otten	Jane Angell		
01951	actuator	box w/ dividers	Warner		388	Debby Woodfill	Lorrie Dahl	candidate for reusable black box	
16909	White hose	box	Midwest Rubber		381	Patty Otten	Jane Angell		
223681	Unknown	box	Motor App.		373	Patty Otten	Lauri Jorgenson		
77790	break shoe assembly	box	Knott Break		360	Debby Woodfill	John French		
82826	Black hose (1" thick)	box	Parker		360	Curt Lange	Rich Carlson		
74163	motor	box w/ dividers	Eaton		348	Debby Woodfill	Duane Davis	candidate for reusable black box	
72991	tank	box, plastic bags, foam sheets	Centro	Iowa	346	Cindy Scheevel	Lorrie Dahl		
84005	muffler	box w/ dividers	Nelson		345	Kwami Ahelegbe	Jane Angell	candidate for reusable black box	
87681	Black tube (1/4" thick)	box	Parker		342	Curt Lange	Rich Carlson		
77315	Black hose (1/2" thick)	box	Parker		340	Curt Lange	Rich Carlson		
77316	Short black hose (1" thick)	box	Parker		340	Curt Lange	Rich Carlson		
77337	Long black hose (1/2" thick)	box	Parker		340	Curt Lange	Rich Carlson		
16462	Black hose (1/2" thick)	box	Parker		340	Curt Lange	Rich Carlson		
78810	Long black hose (1/2" thick)	box	Parker		340	Curt Lange	Rich Carlson		
77304	Short black tube (1/2" thick)	box	Parker		340	Curt Lange	Rich Carlson		
78780	Short black hose (1" thick)	box	Parker		327	Curt Lange	Rich Carlson		
77305	Short black hose (1/4" thick)	box	Parker		327	Curt Lange	Rich Carlson		
77303	Long black tube (1/4" thick)	box	Parker		327	Curt Lange	Rich Carlson		
77338	Black hose (1/2" thick)	box	Parker		327	Curt Lange	Rich Carlson		
77311	Black hose (1/4" thick)	box	Parker		327	Curt Lange	Rich Carlson		
78777	Black tube (1-1/2" thick)	box	Parker		327	Curt Lange	Rich Carlson		
36146	hose	box	Parker		320				
80461	pump	box w/ dividers	Met		320	Debby Woodfill	John French	candidate for reusable black box	
57499	steering wheel	big box	West American		318	Randy Skogman	Duane Davis		
63276	Green hose	box	Cuthill Corp. Cable Craft Div.	St. Matthews, SC	317	Diana Meyer	Jane Angell		
02549	Black hose (1/4" thick)	box	Parker		309	Curt Lange	Rich Carlson		
76383	muffler	box w/ dividers	Nelson		302	Kwami Ahelegbe	Lauri Jorgenson	candidate for reusable black box	
80468	Plastic cover	box, plastic bag	Thermoform Plastics	White Bear Lake, MN	294	Patty Otten	John French		
63294	seat	box, plastic bag	Seats Inc.		291	Randy Skogman	Rich Carlson		
65204	Black hose (1/2" thick)	box	Parker		289	Curt Lange	Rich Carlson		
65199	Black hose (1" thick)	box	Parker		289	Curt Lange	Rich Carlson		
360175	motor	box w/ dividers	Advanced DC		280	Debby Woodfill	Duane Davis	candidate for reusable black box	
360366	Black metal hose	box	Unknown		277				
56465	muffler	box, level dividers	Nelson		273	Kwami Ahelegbe	John French	candidate for reusable black box	
82342	seat	box, plastic bag	Michigan Seat	Jackson, MI	266	Randy Skogman	Jane Angell		
79326	pump	box w/ dividers	Flojet		263	Debby Woodfill	Duane Davis	candidate for reusable black box	
222161	casting	shrink wrap	Plant II		258		Tom Runyon	come into plant II	
10136	Batteries	box	Trojan Battery Company	Lithuania, GA	256	Patty Otten	Lauri Jorgenson		
361034	Black hose (1/4" thick)	box	Parker		250	Curt Lange	Rich Carlson		
360351	muffler	box	Nelson		248	Kwami Ahelegbe	Rick Anderson	lots around, good possible candidate	

Sorted by Quantity

Appendix A: Parts Inventory

77602	Batteries	box	Trojan Battery Company	Lithuania, GA	246	Patty Otten	Lauri Jorgenson		
86926	Foam Pad (hook shaped)	box	Precision GA		244	Patty Otten	Jane Angell		
32477	Black hose	box	Orscheln		242	Diana Meyer	Jane Angell		
02063	radiator tube	box	RAO Manufacturing		240	Curt Lange	Rich Carlson		
79323	pump	box w/ dividers	Gorman Ripp		240	Debby Woodfill	Duane Davis	canidate for reusable black box	
80087	Battery	box	Trojan Battery Company	Lithuania, GA	240	Patty Otten	Lauri Jorgenson		
51090	seal, pan side	box	Applied Power Products	Lakeville, MN	234	Patty Otten	Lorrie Dahl		
86926	tank gasket	box	Precision GA (Applied ?)		234	Patty Otten	Tom Runyon		
86141	motor	box w/ dividers	Peerless		231	Debby Woodfill	Tom Runyon	canidate for reusable black box	
53883	plastic tube	box	Seelye Plastic		200	Curt Lange	Lauri Jorgenson	used for service also	
87421	Tires	shrink wrap, level dividers	Dico		198	Curt Lange	John French		
48751	valve	box w/ dividers	Eaton-Hyd		193	Debby Woodfill	Duane Davis	canidate for reusable black box	
363619	pump	box w/ dividers	Barnes JS		183	Debby Woodfill	Duane Davis	canidate for reusable black box	
69657	hose	box	unknown		168	Duane Davis	Duane Davis		
86076	Black plastic	box	Imperial Custom Molding	Rogers, MN	140	Kwami Ahelegbe	Tom Runyon		
74486	window kit	wooden box, not many to a box	TPI		135	Kwami Ahelegbe	John French	could we return box?	
75866	shroud, fan	box	VEE Engineering		132	Kwami Ahelegbe	Tom Runyon		
87432	Tires	shrink wrap, level dividers	Dico		130	Curt Lange	John French		
222810	hose	box	Midwest Rubber		127	Patty Otten	Jane Angell		
73030	muffler	box	Nelson		109	Kwami Ahelegbe	Lauri Jorgenson		
73030	muffler	box w/ dividers, plastic bag	Nelson		109	Kwami Ahelegbe	Lauri Jorgenson	canidate for reusable black box	
360384	engine	box, used to be metal racks	Kohler		105	Kwami Ahelegbe	Rick Anderson	why change?	
360370	wire sleeve	many boxes	DekDuct		104	Curt Lange	Lauri Jorgenson		
361069	Tires	shrink wrap, level dividers	Ind. Tire Sal.		102	Curt Lange	Lorrie Dahl		
70278	Tires	shrink wrap, level dividers	Ind. Tire Sal.		92	Curt Lange	John French		
59574	Black hose (3/4" thick)	box	Parker		91	Curt Lange	Lorrie Dahl		
59575	Black hose, copper curve on one end	box	Parker		91	Curt Lange	Rich Carlson		
222165	casting	shrink wrap	Plant II		86		Duane Davis	come into plant II	
31611	Short black hose (1" thick)	box	Parker		76	Curt Lange	Rich Carlson		
76867	Rectangular foam pad	box	Unknown		72	Patty Otten	Jane Angell		
78012	Large foam pad	box	Applied Power Products	Lakeville, MN	66	Patty Otten	Jane Angell		
50817	radiator tube	box	Shroud Welding MT		64				
73282	radiator tube	box	Linfor		54	Kwami Ahelegbe	Duane Davis		
73283	radiator tube	box	Bauer Welding		54	Kwami Ahelegbe	John French		
14142	Plastic white covers	box	Thermoform Plastics	White Bear Lake, MN	53	Patty Otten	Lorrie Dahl		
84144	Black tube (10 mm thick)	box	Parker		51	Curt Lange	Rich Carlson		
87196	Tires	shrink wrap, level dividers	Unknown		26				
78014	Large square foam pad	box	Applied Power Products	Lakeville, MN	23	Patty Otten	Jane Angell		
78013	U-shaped foam pad	box	Applied Power Products	Lakeville, MN	23	Patty Otten	Jane Angell		
77301	Black tube (3/4" thick)	box	Parker		13	Curt Lange	Lorrie Dahl		
NOTE: ONLY PARTS THAT ARE USED IN ASSEMBLY WERE USED IN THIS LIST BECAUSE THEY PROVIDE THE BEST OPPORTUNITY TO REDUCE SOURCE WASTE.									
ALSO, SOME PARTS THAT ARE OBSOLETE,OR SOON TO BE, WERE OMITTED.									
LAST UP-DATED 7/10/97 12:40 PM									

Sorted by Quantity

Appendix A: Parts Inventory

Part #	Description	Packaging	Manufacturer	Mfg. Location	Quantity	Controller	Purchasing	Notes	Status
47525	Tire	shrink wrap w/ cardboard dividers	Ace Products	Cartisle, PA	522	Curt Lange	Lorrie Dahl		
09027	Tire	shrink wrap, level dividers	Ace Products		829	Curt Lange	John French		
28546	Tire	shrink wrap, level dividers	Ace-Ohio		1,232	Curt Lange	John French		
360175	motor	box w/ dividers	Advanced DC		280	Debby Woodfill	Duane Davis	candidate for reusable black box	
222121	tank gasket	box, cardboard level dividers	Applied Power Products	Lakeville, MN	4,781	Patty Otten	Jane Angell		
51090	seal, pan side	box	Applied Power Products	Lakeville, MN	234	Patty Otten	Lorrie Dahl		
72070	Black rubber	box	Applied Power Products	Lakeville, MN	833	Patty Otten	Lorrie Dahl		
55416	Black rubber piece	box	Applied Power Products	Lakeville, MN	1,061	Patty Otten	Lorrie Dahl		
78012	Large foam pad	box	Applied Power Products	Lakeville, MN	66	Patty Otten	Jane Angell		
78014	Large square foam pad	box	Applied Power Products	Lakeville, MN	23	Patty Otten	Jane Angell		
69986	Rectangular small foam	box	Applied Power Products	Lakeville, MN	1,122	Patty Otten	Jane Angell		
74063	Small foam pads	box	Applied Power Products	Lakeville, MN	391	Patty Otten	Jane Angell		
16903	Sq. foam pads, donut like	box	Applied Power Products	Lakeville, MN	638	Patty Otten	Jane Angell		
72824	Square foam pads	box	Applied Power Products	Lakeville, MN	1,667	Patty Otten	Jane Angell		
78013	U-shaped foam pad	box	Applied Power Products	Lakeville, MN	23	Patty Otten	Jane Angell		
87673	wire sleeve	many boxes	Arden Fast		2,421	Curt Lange	Jane Angell		
53485	motor	box w/ dividers	Barnes JS		1,216	Debby Woodfill	Duane Davis	candidate for reusable black box	
71719	pump	box w/ dividers	Barnes JS		593	Debby Woodfill	Jane Angell	candidate for reusable black box	
363619	pump	box w/ dividers	Barnes JS		183	Debby Woodfill	Duane Davis	candidate for reusable black box	
73283	radiator tube	box	Bauer Welding		54	Kwami Ahelegbe	John French		
59666	leg	Gaylord boxes	Bauer Welding Metal Fab.		574	Kwami Ahelegbe			
360442	Black hose	box	Cablecraft		444	Diana Meyer	Jane Angell		
361044	Short black hose (1/4" thick)	box	Cablecraft		444	Diana Meyer	Jane Angell		
41878	Brush back		Carris Reels		2,160	Patty Otten	WL		
08012	Brush back		Carris Reels		6,750	Patty Otten	WL		
72991	tank	box, plastic bags, foam sheets	Centro	Iowa	346	Cindy Scheevel	Lorrie Dahl		
223053	switch	box w/ dividers	Curtis Instruments		641	Randy Skogman	Duane Davis	candidate for reusable black box	
63276	Green hose	box	Cuthill Corp. Cable Craft Div.	St. Matthews, SC	317	Diana Meyer	Jane Angell		
80028	caster	box	Darcar		3,715	Randy Skogman	John French		
360370	wire sleeve	many boxes	DekDuct		104	Curt Lange	Lauri Jorgenson		
87421	Tires	shrink wrap, level dividers	Dico		198	Curt Lange	John French		
87432	Tires	shrink wrap, level dividers	Dico		130	Curt Lange	John French		
63297	filters	boxes	Donaldson		2,074	Curt Lange	Lorrie Dahl		
74163	motor	box w/ dividers	Eaton		348	Debby Woodfill	Duane Davis	candidate for reusable black box	
53554	hydraulic pump	box w/ dividers	Eaton-Hyd		624	Debby Woodfill	Duane Davis	candidate for reusable black box	
57935	steering gear	box w/ dividers	Eaton-Hyd		1,216	Debby Woodfill	Duane Davis	candidate for reusable black box	
48751	valve	box w/ dividers	Eaton-Hyd		193	Debby Woodfill	Duane Davis	candidate for reusable black box	
16202	Black cylinders a round disc	box	Elastomer		617	Debby Woodfill	Lauri Jorgenson		
222857	harness, main	box	Electrical Wire Prod.	Minneapolis, MN	2,966	Randy Skogman	Rich Carlson		
222835	harness, wire, cylinder head	box	Fargo Assembly	Norristown, PA	2,533	Randy Skogman	Rich Carlson		
222836	harness, wire, disk head	box	Fargo Assembly	Norristown, PA	2,816	Randy Skogman	Rich Carlson		
222837	harness, wire, disk head	box	Fargo Assembly	Norristown, PA	487	Randy Skogman	Rich Carlson		
43516A	soap basket	box, level dividers	Filtertek		1,017	Kwami Ahelegbe	Tom Runyon		
17128	pump	box w/ dividers	Flojet		399	Debby Woodfill	Duane Davis	candidate for reusable black box	
79326	pump	box w/ dividers	Flojet		263	Debby Woodfill	Duane Davis	candidate for reusable black box	
222353	pump	box, w/ dividers	Flojet		1,643	Debby Woodfill	Duane Davis	candidate for reusable black box	
59881	hose/belt	box	Gates		1,151	Debby Woodfill	Lauri Jorgenson		
41678	belt	box	Gates (Goodyear-VB)		1,003	Debby Woodfill	Lauri Jorgenson		
31517	Black hose	box	Gates Rubber Company	Polar Bluff, MO	1,132	Debby Woodfill	Jane Angell		
71916	Curved hose	box	Gates Rubber Company	Polar Bluff, MO	606	Debby Woodfill	Lauri Jorgenson		
80148	tire	shrink wrap, cardboard level dividers	Gleason		3,676	Curt Lange	Rick Anderson		
79323	pump	box w/ dividers	Gorman Ripp		240	Debby Woodfill	Duane Davis	candidate for reusable black box	
58524	headlight	box w/ dividers	Hobbs Corp.		4,170	Randy Skogman	Lauri Jorgenson	candidate for reusable black box	

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54930	vaporizer	box w/ dividers	Impco Carb.		719	Kwami Ahelegbe	Rich Carlson	canidate for reusable black box	
86076	Black plastic	box	Imperial Custom Molding	Rogers, MN	140	Kwami Ahelegbe	Tom Runyon		
80047	Black plastic, big hole in it	box	Imperial Custom Molding	Rogers, MN	1,876	Kwami Ahelegbe	Tom Runyon		
80414	Black plastic, pie-shaped	box	Imperial Custom Molding	Rogers, MN	1,899	Kwami Ahelegbe	Tom Runyon		
80047	brush arm	box	Imperial Custom Molding	Rogers, MN	1,851	Kwami Ahelegbe	Tom Runyon		
80043	Brush back		Imperial Custom Molding	Rogers, MN	3,600	Kwami Ahelegbe	Tom Runyon		
80424	Circular, holes in middle	box	Imperial Custom Molding	Rogers, MN	1,813	Kwami Ahelegbe	Tom Runyon		
14880	Clear plastic cap	box	Imperial Custom Molding	Rogers, MN	4,933	Kwami Ahelegbe	Tom Runyon		
23456	Clear plastic nuts	box	Imperial Custom Molding	Rogers, MN	3,843	Kwami Ahelegbe	Tom Runyon		
80320	Gray disc, fins on it	box	Imperial Custom Molding	Rogers, MN	1,865	Kwami Ahelegbe	Tom Runyon		
80465	hubcap	box	Imperial Custom Molding	Rogers, MN	3,650	Kwami Ahelegbe	Tom Runyon		
45962	Plastic elliptical clear pieces	box	Imperial Custom Molding	Rogers, MN	58,611	Kwami Ahelegbe	Tom Runyon		
222244	plastic piece	box, level dividers	Imperial Custom Molding	Rogers, MN	11,249	Kwami Ahelegbe	Tom Runyon		
222092	steering housing	shrink wrap, corners	Imperial Custom Molding	Rogers, MN	3,033	Kwami Ahelegbe	Tom Runyon		
222093	steering housing	shrink wrap, corners	Imperial Custom Molding	Rogers, MN	1,513	Kwami Ahelegbe	Tom Runyon		
222748	steering shroud	shrink wrap, corners	Imperial Custom Molding	Rogers, MN	5,088	Kwami Ahelegbe	Tom Runyon		
53817	Tires	shrink wrap, level dividers	Ind. Tire Sal.		531	Curt Lange	John French		
360769	Tires	shrink wrap, level dividers	Ind. Tire Sal.		450	Curt Lange	John French		
361069	Tires	shrink wrap, level dividers	Ind. Tire Sal.		102	Curt Lange	John French		
70278	Tires	shrink wrap, level dividers	Ind. Tire Sal.		92	Curt Lange	John French		
70288	Tires	shrink wrap, level dividers	Ind. Tire Sal.		521	Curt Lange	John French		
77790	break shoe assembly	box	Knott Break		360	Debby Woodfill	John French		
360384	engine	box, used to be metal racks	Kohler		105	Kwami Ahelegbe	Rick Anderson	why change?	
87689	Black hose	box	Lakeview Ind.		1,099	Kwami Ahelegbe	Tom Runyon		
73282	radiator tube	box	Linfor		54	Kwami Ahelegbe	Duane Davis		
24928-1	gas tank	string w/ plastic web	Mancheaster Tank		600	Curt Lange	John French	go back to cardboard protectors?	
54121	actuator	box w/ dividers	Met		3,141	Debby Woodfill	Duane Davis	canidate for reusable black box	
31999	motor	box w/ dividers	Met		569	Debby Woodfill	Duane Davis	canidate for reusable black box	
80461	pump	box w/ dividers	Met		320	Debby Woodfill	John French	canidate for reusable black box	
77235	seat	box, plastic bag	Michigan Seat Company	Jackson, MI	915	Randy Skogman	Lauri Jorgenson		
82342	seat	box, plastic bag	Michigan Seat Company	Jackson, MI	2,643	Randy Skogman	Lauri Jorgenson		
223077	seat	box, plastic bag	Michigan Seat Company	Jackson, MI	884	Randy Skogman	Lauri Jorgenson		
77235	Black seats	box	Michigan Seat Company	Jackson, MI	947	Randy Skogman	Lauri Jorgenson		
47069	2 Foam pieces, donut like	box	Midwest Rubber		1,210	Patty Otten	Jane Angell		
44255	Black hose	box	Midwest Rubber		1,755	Patty Otten	Jane Angell		
05216	hose	box	Midwest Rubber		1,239	Patty Otten	Lorrie Dahl		
20971	hose	box	Midwest Rubber		705	Patty Otten	Jane Angell		
64317	hose	box	Midwest Rubber		972	Patty Otten	Jane Angell		
64320	hose	box	Midwest Rubber		2,982	Patty Otten	Jane Angell		
222379	hose	box	Midwest Rubber		5,174	Kwami Ahelegbe	Jane Angell		
222810	hose	box	Midwest Rubber		127	Patty Otten	Jane Angell		
C460165	Kuritec hose	wrapped in plastic	Midwest Rubber		22,177	Patty Otten	Jane Angell		
222180	red rubber squeegee	box	Midwest Rubber		14,786	Patty Otten	Jane Angell		
25649	Short clear hose, opaque string through it	box	Midwest Rubber		484	Patty Otten	Jane Angell		
16909	White hose	box	Midwest Rubber		381	Patty Otten	Jane Angell		
52238	spring	box	Midwest Spring		2,277	Randy Skogman	Lauri Jorgenson	hard to count if too big of box	
72159	washer	box	Minneapolis Washer	Minneapolis, MN	8,383	Curt Lange	Jane Angell		
16917	Gray hose	box	MN Flex		842	Patty Otten	Jane Angell		
75635	nozzle	box	MN Flex		765	Patty Otten	Jane Angell		
223681	Unknown	box	Motor App.		373	Patty Otten	Lauri Jorgenson		
56465	muffler	box, level dividers	Nelson		273	Kwami Ahelegbe	John French	canidate for reusable black box	
73030	muffler	box	Nelson		109	Kwami Ahelegbe	Lauri Jorgenson		
73030	muffler	box w/ dividers, plastic bag	Nelson		109	Kwami Ahelegbe	Lauri Jorgenson	canidate for reusable black box	
76383	muffler	box w/ dividers	Nelson		302	Kwami Ahelegbe	Lauri Jorgenson	canidate for reusable black box	

Sorted by Manufacturer

Appendix A: Parts Inventory

84005	muffler	box w/ dividers	Nelson		345	Kwami Ahelegbe	Jane Angell	canidate for reusable black box	
360351	muffler	box	Nelson		248	Kwami Ahelegbe	Rick Anderson	lots around, good possible canidate	
05127	hose	box	no Pur I/M		1,805	Patty Otten	Lorrie Dahl		
370100	4 prong knob	box	OEP	Wheeling, IL	31,019	Curt Lange	Lauri Jorgenson		
16224	motor	box w/ dividers	Ohio Electric		1,834	Kwami Ahelegbe	Duane Davis	canidate for reusable black box	
32477	Black hose	box	Orscheln		242	Diana Meyer	Jane Angell		
57962	1/4" thick tube	box	Parker		1,135	Curt Lange	Rich Carlson		
361046	Black hose	box	Parker		552	Curt Lange	Rich Carlson		
59560	Black hose	box	Parker		640	Curt Lange	Rich Carlson		
65201	Black hose (1" thick)	box	Parker		654	Curt Lange	Rich Carlson		
65199	Black hose (1" thick)	box	Parker		289	Curt Lange	Rich Carlson		
77338	Black hose (1/2" thick)	box	Parker		327	Curt Lange	Rich Carlson		
77315	Black hose (1/2" thick)	box	Parker		340	Curt Lange	Rich Carlson		
16462	Black hose (1/2" thick)	box	Parker		340	Curt Lange	Rich Carlson		
77311	Black hose (1/4" thick)	box	Parker		327	Curt Lange	Rich Carlson		
57964	Black hose (1/4" thick)	box	Parker		6,080	Curt Lange	Rich Carlson		
59585	Black hose (1/4" thick)	box	Parker		594	Curt Lange	Rich Carlson		
82826	Black hose (1" thick)	box	Parker		360	Curt Lange	Rich Carlson		
35488	Black hose (1" thick)	box	Parker		1,016	Curt Lange	Rich Carlson		
59303	Black hose (1" thick) curved on one end	box	Parker		507	Curt Lange	Rich Carlson		
59106	Black hose (1" thick) curved on one end	box	Parker		583	Curt Lange	Rich Carlson		
361034	Black hose (1/4" thick)	box	Parker		250	Curt Lange	Rich Carlson		
59574	Black hose (3/4" thick)	box	Parker		91	Curt Lange	Lorrie Dahl		
59575	Black hose, copper curve on one end	box	Parker		91	Curt Lange	Rich Carlson		
361036	Black hose, curve on one end	box	Parker		500	Curt Lange	Rich Carlson		
78777	Black tube (1-1/2" thick)	box	Parker		327	Curt Lange	Rich Carlson		
19644	Black tube (1/4" thick)	box	Parker		2,639	Curt Lange	Rich Carlson		
87681	Black tube (1/4" thick)	box	Parker		342	Curt Lange	Rich Carlson		
84144	Black tube (10 mm thick)	box	Parker		51	Curt Lange	Rich Carlson		
77301	Black tube (3/4" thick)	box	Parker		13	Curt Lange	Lorrie Dahl		
36146	hose	box	Parker		320				
360442	hose	box	Parker		443	Diana Meyer	Jane Angell		
77337	Long black hose (1/2" thick)	box	Parker		340	Curt Lange	Rich Carlson		
78810	Long black hose (1/2" thick)	box	Parker		340	Curt Lange	Rich Carlson		
31610	Long black hose (3/4" thick)	box	Parker		574	Curt Lange	Rich Carlson		
57963	Long black tube (1/2" thick)	box	Parker		1,867	Curt Lange	Rich Carlson		
77303	Long black tube (1/4" thick)	box	Parker		327	Curt Lange	Rich Carlson		
77306	Long black tube (1/4" thick)	box	Parker		1,247	Curt Lange	Rich Carlson		
31611	Short black hose (1" thick)	box	Parker		76	Curt Lange	Rich Carlson		
77316	Short black hose (1" thick)	box	Parker		340	Curt Lange	Rich Carlson		
78780	Short black hose (1" thick)	box	Parker		327	Curt Lange	Rich Carlson		
49943	Short black hose (1/2" thick)	box	Parker		1,085	Curt Lange	Rich Carlson		
77305	Short black hose (1/4" thick)	box	Parker		327	Curt Lange	Rich Carlson		
59584	Short black hose (1/4" thick)	box	Parker		520	Curt Lange	Rich Carlson		
77304	Short black tube (1/2" thick)	box	Parker		340	Curt Lange	Rich Carlson		
02549	Black hose (1/4" thick)	box	Parker		309	Curt Lange	Rich Carlson		
65204	Black hose (1/2" thick)	box	Parker		289	Curt Lange	Rich Carlson		
80427	nozzle	box	Pawnee		1,825	Cindy Scheevel	John French		
86141	motor	box w/ dividers	Peerless		231	Debby Woodfill	Tom Runyon	canidate for reusable black box	
222161	casting	shrink wrap	Plant II		258		Tom Runyon	come into plant II	

Sorted by Manufacturer

Appendix A: Parts Inventory

222165	casting	shrink wrap	Plant II		86		Duane Davis	come into plant II	
223573	casting	shrink wrap	Plant II		778			come into plant II	
86926	Foam Pad (hook shaped)	box	Precision GA		244	Patty Otten	Jane Angell		
86926	tank gasket	box	Precision GA (Applied ?)		234	Patty Otten	Tom Runyon		
02063	radiator tube	box	RAO Manufacturing		240	Curt Lange	Rich Carlson		
63294	seat	box, plastic bag	Seats Inc.		291	Randy Skogman	Rich Carlson		
53883	plastic tube	box	Seelye Plastic		200	Curt Lange	Lauri Jorgenson	used for service also	
50817	radiator tube	box	Shroud Welding MT		64				
80022	differential	box w/ dividers	Tecumseh		1,826	Debby Woodfill	John French	canidate for reusable black box	
56398	steering wheel	big box w/ plastic bag around each wheel	TEI Group		3,258	Randy Skogman	John French		
17191	Battery Tray	box	Thermoform Plastics	White Bear Lake, MN	595	Patty Otten	John French		
80470	Plastic cover	box, plastic bag	Thermoform Plastics	White Bear Lake, MN	1,202	Patty Otten	John French		
80468	Plastic cover	box, plastic bag	Thermoform Plastics	White Bear Lake, MN	294	Patty Otten	John French		
14444	Plastic cover	box, plastic bag	Thermoform Plastics	White Bear Lake, MN	617	Patty Otten	John French		
08911	Plastic cover	box, plastic bag	Thermoform Plastics	White Bear Lake, MN	901	Patty Otten	John French		
80469	plastic piece	box, plastic bag, foam sheets	Thermoform Plastics	White Bear Lake, MN	409	Patty Otten	John French		
14142	Plastic white covers	box	Thermoform Plastics	White Bear Lake, MN	53	Patty Otten	Lorrie Dahl		
54342	plastic cover	box, plastic bag, foam sheets	Thermoform Plastocs	White Bear Lake, MN	1,153	Patty Otten	John French		
74486	window kit	wooden box, not many to a box	TPI		135	Kwami Ahelegbe	John French	could we return box?	
10136	Batteries	box	Trojan Battery Company	Lithuania, GA	256	Patty Otten	Lauri Jorgenson		
222846	Batteries	box	Trojan Battery Company	Lithuania, GA	7,296	Patty Otten	Lauri Jorgenson		
222847	Batteries	box	Trojan Battery Company	Lithuania, GA	1,287	Patty Otten	Lauri Jorgenson		
77602	Batteries	box	Trojan Battery Company	Lithuania, GA	246	Patty Otten	Lauri Jorgenson		
80063	Batteries	box	Trojan Battery Company	Lithuania, GA	734	Patty Otten	Lauri Jorgenson		
10143	Battery	box	Trojan Battery Company	Lithuania, GA	728	Patty Otten	Lauri Jorgenson		
80087	Battery	box	Trojan Battery Company	Lithuania, GA	240	Patty Otten	Lauri Jorgenson		
360366	Black metal hose	box	Unknown		277				
69657	hose	box	unknown		168		Duane Davis		
76867	Rectangular foam pad	box	Unknown		72	Patty Otten	Jane Angell		
87196	Tires	shrink wrap, level dividers	Unknown		26				
360071	Tires	shrink wrap, level dividers	Unknown		1,623	Curt Lange	John French		
54437	Tires	shrink wrap, level dividers	Unknown		3,925				
70287	Tires	shrink wrap, level dividers	Unknown		1,273	Curt Lange	John French		
60395	Tires	shrink wrap, level dividers	Unknown		576				
75866	shroud, fan	box	VEE Engineering		132	Kwami Ahelegbe	Tom Runyon		
363621	actuator	box w/ dividers	Von Wiese		556	Debby Woodfill	Duane Davis	canidate for reusable black box	
01951	actuator	box w/ dividers	Warner		388	Debby Woodfill	Lorrie Dahl	canidate for reusable black box	
363152	actuator	box w/ dividers	Warner		612	Debby Woodfill	Duane Davis	canidate for reusable black box	
57499	steering wheel	big box	West American		318	Randy Skogman	Duane Davis		
ALSO, SOME PARTS THAT ARE OBSOLETE,OR SOON TO BE, WERE OMITTED.									
65340	cover for rubber strips	shrink wrap			559	Patty Otten		from Holland, MI plant	
	LAST UP-DATED 7/10/97 12:40 PM								
NOTE: ONLY PARTS THAT ARE USED IN ASSEMBLY WERE USED IN THIS LIST BECAUSE THEY PROVIDE THE BEST OPPORTUNITY TO REDUCE SOURCE WASTE.									

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Appndix A: Parts Inventory

Part #	Description	Packaging	Manufacturer	Mfg. Location	Quantity	Controller	Purchasing	Notes	Status
01951	actuator	box w/ dividers	Warner		388	Debby Woodfill	Lorrie Dahl	candidate for reusable black box	
54121	actuator	box w/ dividers	Met		3,141	Debby Woodfill	Duane Davis	candidate for reusable black box	
363152	actuator	box w/ dividers	Warner		612	Debby Woodfill	Duane Davis	candidate for reusable black box	
363621	actuator	box w/ dividers	Von Wiese		556	Debby Woodfill	Duane Davis	candidate for reusable black box	
80022	differential	box w/ dividers	Tecumseh		1,826	Debby Woodfill	John French	candidate for reusable black box	
58524	headlight	box w/ dividers	Hobbs Corp.		4,170	Randy Skogman	Lauri Jorgenson	candidate for reusable black box	
53554	hydraulic pump	box w/ dividers	Eaton-Hyd		624	Debby Woodfill	Duane Davis	candidate for reusable black box	
16224	motor	box w/ dividers	Ohio Electric		1,834	Kwami Ahelegbe	Duane Davis	candidate for reusable black box	
31999	motor	box w/ dividers	Met		569	Debby Woodfill	Duane Davis	candidate for reusable black box	
53485	motor	box w/ dividers	Barnes JS		1,216	Debby Woodfill	Duane Davis	candidate for reusable black box	
74163	motor	box w/ dividers	Eaton		348	Debby Woodfill	Duane Davis	candidate for reusable black box	
86141	motor	box w/ dividers	Peerless		231	Debby Woodfill	Tom Runyon	candidate for reusable black box	
360175	motor	box w/ dividers	Advanced DC		280	Debby Woodfill	Duane Davis	candidate for reusable black box	
56465	muffler	box, level dividers	Nelson		273	Kwami Ahelegbe	John French	candidate for reusable black box	
73030	muffler	box w/ dividers, plastic bag	Nelson		109	Kwami Ahelegbe	Lauri Jorgenson	candidate for reusable black box	
76383	muffler	box w/ dividers	Nelson		302	Kwami Ahelegbe	Lauri Jorgenson	candidate for reusable black box	
84005	muffler	box w/ dividers	Nelson		345	Kwami Ahelegbe	Jane Angell	candidate for reusable black box	
17128	pump	box w/ dividers	Flojet		399	Debby Woodfill	Duane Davis	candidate for reusable black box	
71719	pump	box w/ dividers	Barnes JS		593	Debby Woodfill	Jane Angell	candidate for reusable black box	
79323	pump	box w/ dividers	Gorman Ripp		240	Debby Woodfill	Duane Davis	candidate for reusable black box	
79326	pump	box w/ dividers	Flojet		263	Debby Woodfill	Duane Davis	candidate for reusable black box	
80461	pump	box w/ dividers	Met		320	Debby Woodfill	John French	candidate for reusable black box	
222353	pump	box, w/ dividers	Flojet		1,643	Debby Woodfill	Duane Davis	candidate for reusable black box	
363619	pump	box w/ dividers	Barnes JS		183	Debby Woodfill	Duane Davis	candidate for reusable black box	
57935	steering gear	box w/ dividers	Eaton-Hyd		1,216	Debby Woodfill	Duane Davis	candidate for reusable black box	
223053	switch	box w/ dividers	Curtis Instruments		641	Randy Skogman	Duane Davis	candidate for reusable black box	
48751	valve	box w/ dividers	Eaton-Hyd		193	Debby Woodfill	Duane Davis	candidate for reusable black box	
54930	vaporizer	box w/ dividers	Impco Carb.		719	Kwami Ahelegbe	Rich Carlson	candidate for reusable black box	
222161	casting	shrink wrap	Plant II		258		Tom Runyon	come into plant II	
222165	casting	shrink wrap	Plant II		86		Duane Davis	come into plant II	
223573	casting	shrink wrap	Plant II		778			come into plant II	
74486	window kit	wooden box, not many to a box	TPI		135	Kwami Ahelegbe	John French	could we return box?	
65340	cover for rubber strips	shrink wrap			559	Patty Otten		from Holland, MI plant	
24928-1	gas tank	string w/ plastic web	Mancheaster Tank		600	Curt Lange	John French	go back to cardboard protectors?	
52238	spring	box	Midwest Spring		2,277	Randy Skogman	Lauri Jorgenson	hard to count if too big of box	
360351	muffler	box	Nelson		248	Kwami Ahelegbe	Rick Anderson	lots around, good possible candidate	
53883	plastic tube	box	Seelye Plastic		200	Curt Lange	Lauri Jorgenson	used for service also	
360384	engine	box, used to be metal racks	Kohler		105	Kwami Ahelegbe	Rick Anderson	why change?	
57962	1/4" thick tube	box	Parker		1,135	Curt Lange	Rich Carlson		
47069	2 Foam pieces, donut like	box	Midwest Rubber		1,210	Patty Otten	Jane Angell		
370100	4 prong knob	box	OEP	Wheeling, IL	31,019	Curt Lange	Lauri Jorgenson		
10136	Batteries	box	Trojan Battery Company	Lithuania, GA	256	Patty Otten	Lauri Jorgenson		
222846	Batteries	box	Trojan Battery Company	Lithuania, GA	7,296	Patty Otten	Lauri Jorgenson		
222847	Batteries	box	Trojan Battery Company	Lithuania, GA	1,287	Patty Otten	Lauri Jorgenson		
77602	Batteries	box	Trojan Battery Company	Lithuania, GA	246	Patty Otten	Lauri Jorgenson		
80063	Batteries	box	Trojan Battery Company	Lithuania, GA	734	Patty Otten	Lauri Jorgenson		
10143	Battery	box	Trojan Battery Company	Lithuania, GA	728	Patty Otten	Lauri Jorgenson		
80087	Battery	box	Trojan Battery Company	Lithuania, GA	240	Patty Otten	Lauri Jorgenson		
17191	Battery Tray	box	Thermoform Plastics	White Bear Lake, MN	595	Patty Otten	John French		
41678	belt	box	Gates (Goodyear-VB)		1,003	Debby Woodfill	Lauri Jorgenson		
16202	Black cylinders a round disc	box	Elastomer		617	Debby Woodfill	Lauri Jorgenson		
32477	Black hose	box	Orscheln		242	Diana Meyer	Jane Angell		
31517	Black hose	box	Gates Rubber Company	Polar Bluff, MO	1,132	Debby Woodfill	Jane Angell		

Sorted by Notes Column

Appnedix A: Parts Inventory

44255	Black hose	box	Midwest Rubber		1,755	Patty Otten	Jane Angell		
360442	Black hose	box	Cablecraft		444	Diana Meyer	Jane Angell		
361046	Black hose	box	Parker		552	Curt Lange	Rich Carlson		
59560	Black hose	box	Parker		640	Curt Lange	Rich Carlson		
87689	Black hose	box	Lakeview Ind.		1,099	Kwami Ahelegbe	Tom Runyon		
65201	Black hose (1" thick)	box	Parker		654	Curt Lange	Rich Carlson		
65199	Black hose (1" thick)	box	Parker		289	Curt Lange	Rich Carlson		
02549	Black hose (1/4" thick)	box	Parker		309	Curt Lange	Rich Carlson		
65204	Black hose (1/2" thick)	box	Parker		289	Curt Lange	Rich Carlson		
77338	Black hose (1/2" thick)	box	Parker		327	Curt Lange	Rich Carlson		
77315	Black hose (1/2" thick)	box	Parker		340	Curt Lange	Rich Carlson		
16462	Black hose (1/2" thick)	box	Parker		340	Curt Lange	Rich Carlson		
77311	Black hose (1/4" thick)	box	Parker		327	Curt Lange	Rich Carlson		
57964	Black hose (1/4" thick)	box	Parker		6,080	Curt Lange	Rich Carlson		
59585	Black hose (1/4" thick)	box	Parker		594	Curt Lange	Rich Carlson		
82826	Black hose (1" thick)	box	Parker		360	Curt Lange	Rich Carlson		
35488	Black hose (1" thick)	box	Parker		1,016	Curt Lange	Rich Carlson		
59303	Black hose (1" thick) curved on one end	box	Parker		507	Curt Lange	Rich Carlson		
59106	Black hose (1" thick) curved on one end	box	Parker		583	Curt Lange	Rich Carlson		
361034	Black hose (1/4" thick)	box	Parker		250	Curt Lange	Rich Carlson		
59574	Black hose (3/4" thick)	box	Parker		91	Curt Lange	Lorrie Dahl		
59575	Black hose, copper curve on one end	box	Parker		91	Curt Lange	Rich Carlson		
361036	Black hose, curve on one end	box	Parker		500	Curt Lange	Rich Carlson		
360366	Black metal hose	box	Unknown		277				
86076	Black plastic	box	Imperial Custom Molding	Rogers, MN	140	Kwami Ahelegbe	Tom Runyon		
80047	Black plastic, big hole in it	box	Imperial Custom Molding	Rogers, MN	1,876	Kwami Ahelegbe	Tom Runyon		
80414	Black plastic, pie-shaped	box	Imperial Custom Molding	Rogers, MN	1,899	Kwami Ahelegbe	Tom Runyon		
72070	Black rubber	box	Applied Power Products	Lakeville, MN	833	Patty Otten	Lorrie Dahl		
55416	Black rubber piece	box	Applied Power Products	Lakeville, MN	1,061	Patty Otten	Lorrie Dahl		
77235	Black seats	box	Michigan Seat Company	Jackson, MI	947	Randy Skogman	Lauri Jorgenson		
78777	Black tube (1-1/2" thick)	box	Parker		327	Curt Lange	Rich Carlson		
19644	Black tube (1/4" thick)	box	Parker		2,639	Curt Lange	Rich Carlson		
87681	Black tube (1/4" thick)	box	Parker		342	Curt Lange	Rich Carlson		
84144	Black tube (10 mm thick)	box	Parker		51	Curt Lange	Rich Carlson		
77301	Black tube (3/4" thick)	box	Parker		13	Curt Lange	Lorrie Dahl		
77790	break shoe assembly	box	Knott Break		360	Debby Woodfill	John French		
80047	brush arm	box	Imperial Custom Molding	Rogers, MN	1,851	Kwami Ahelegbe	Tom Runyon		
80424	brush arm	box	Imperial Custom Molding	Rogers, MN	1,788	Kwami Ahelegbe	Duane Davis		
80043	Brush back		Imperial Custom Molding	Rogers, MN	3,600	Kwami Ahelegbe	Tom Runyon		
41878	Brush back		Carris Reels		2,160	Patty Otten	WL		
08012	Brush back		Carris Reels		6,750	Patty Otten	WL		
80028	caster	box	Darcar		3,715	Randy Skogman	John French		
80424	Circular, holes in middle	box	Imperial Custom Molding	Rogers, MN	1,813	Kwami Ahelegbe	Tom Runyon		
14880	Clear plastic cap	box	Imperial Custom Molding	Rogers, MN	4,933	Kwami Ahelegbe	Tom Runyon		
23456	Clear plastic nuts	box	Imperial Custom Molding	Rogers, MN	3,843	Kwami Ahelegbe	Tom Runyon		
71916	Curved hose	box	Gates Rubber Company	Polar Bluff, MO	606	Debby Woodfill	Lauri Jorgenson		
63297	filters	boxes	Donaldson		2,074	Curt Lange	Lorrie Dahl		
86926	Foam Pad (hook shaped)	box	Precision GA		244	Patty Otten	Jane Angell		
80320	Gray disc, fins on it	box	Imperial Custom Molding	Rogers, MN	1,865	Kwami Ahelegbe	Tom Runyon		
16917	Gray hose	box	MN Flex		842	Patty Otten	Jane Angell		
63276	Green hose	box	Cuthill Corp. Cable Craft Div.	St. Matthews, SC	317	Diana Meyer	Jane Angell		

Sorted by Notes Column

Appnedix A: Parts Inventory

222857	harness, main	box	Electrical Wire Prod.	Minneapolis, MN	2,966	Randy Skogman	Rich Carlson		
222835	harness, wire, cylinder head	box	Fargo Assembly	Norristown, PA	2,533	Randy Skogman	Rich Carlson		
222836	harness, wire, disk head	box	Fargo Assembly	Norristown, PA	2,816	Randy Skogman	Rich Carlson		
222837	harness, wire, disk head	box	Fargo Assembly	Norristown, PA	487	Randy Skogman	Rich Carlson		
05127	hose	box	no Pur I/M		1,805	Patty Otten	Lorrie Dahl		
05216	hose	box	Midwest Rubber		1,239	Patty Otten	Lorrie Dahl		
20971	hose	box	Midwest Rubber		705	Patty Otten	Jane Angell		
36146	hose	box	Parker		320				
64317	hose	box	Midwest Rubber		972	Patty Otten	Jane Angell		
64320	hose	box	Midwest Rubber		2,982	Patty Otten	Tom Runyon		
69657	hose	box	unknown		168		Duane Davis		
222379	hose	box	Midwest Rubber		5,174	Kwami Ahelegbe	Jane Angell		
222810	hose	box	Midwest Rubber		127	Patty Otten	Jane Angell		
360442	hose	box	Parker		443	Diana Meyer	Jane Angell		
59881	hose/belt	box	Gates		1,151	Debby Woodfill	Lauri Jorgenson		
80465	hubcap	box	Imperial Custom Molding	Rogers, MN	3,650	Kwami Ahelegbe	Lauri Jorgenson		
C460165	Kuritec hose	wrapped in plastic	Midwest Rubber		22,177	Patty Otten	Jane Angell		
78012	Large foam pad	box	Applied Power Products	Lakeville, MN	66	Patty Otten	Jane Angell		
78014	Large square foam pad	box	Applied Power Products	Lakeville, MN	23	Patty Otten	Jane Angell		
LAST UP-DATED 7/10/97 12:40 PM									
59666	leg	Gaylord boxes	Bauer Welding Metal Fab.		574	Kwami Ahelegbe			
77337	Long black hose (1/2" thick)	box	Parker		340	Curt Lange	Rich Carlson		
78810	Long black hose (1/2" thick)	box	Parker		340	Curt Lange	Rich Carlson		
31610	Long black hose (3/4" thick)	box	Parker		574	Curt Lange	Rich Carlson		
57963	Long black tube (1/2" thick)	box	Parker		1,867	Curt Lange	Rich Carlson		
77303	Long black tube (1/4" thick)	box	Parker		327	Curt Lange	Rich Carlson		
77306	Long black tube (1/4" thick)	box	Parker		1,247	Curt Lange	Rich Carlson		
73030	muffler	box	Nelson		109	Kwami Ahelegbe	Lauri Jorgenson		
75635	nozzle	box	MN Flex		765	Patty Otten	Jane Angell		
80427	nozzle	box	Pawnee		1,825	Cindy Scheevel	John French		
54342	plastic cover	box, plastic bag, foam sheets	Thermoform Plastocs	White Bear Lake, MN	1,153	Patty Otten	John French		
80470	Plastic cover	box, plastic bag	Thermoform Plastics	White Bear Lake, MN	1,202	Patty Otten	John French		
80468	Plastic cover	box, plastic bag	Thermoform Plastics	White Bear Lake, MN	294	Patty Otten	John French		
14444	Plastic cover	box, plastic bag	Thermoform Plastics	White Bear Lake, MN	617	Patty Otten	John French		
08911	Plastic cover	box, plastic bag	Thermoform Plastics	White Bear Lake, MN	901	Patty Otten	John French		
45962	Plastic elliptical clear pieces	box	Imperial Custom Molding	Rogers, MN	58,611	Kwami Ahelegbe	Tom Runyon		
80469	plastic piece	box, plastic bag, foam sheets	Thermoform Plastics	White Bear Lake, MN	398	Patty Otten	Duane Davis		
222244	plastic piece	box, level dividers	Imperial Custom Molding	Rogers, MN	11,249	Kwami Ahelegbe	Tom Runyon		
14142	Plastic white covers	box	Thermoform Plastics	White Bear Lake, MN	53	Patty Otten	Lorrie Dahl		
02063	radiator tube	box	RAO Manufacturing		240	Curt Lange	Rich Carlson		
50817	radiator tube	box	Shroud Welding MT		64				
73282	radiator tube	box	Linfor		54	Kwami Ahelegbe	Duane Davis		
73283	radiator tube	box	Bauer Welding		54	Kwami Ahelegbe	John French		
76867	Rectangular foam pad	box	Unknown		72	Patty Otten	Jane Angell		
69986	Rectangular small foam	box	Applied Power Products	Lakeville, MN	1,122	Patty Otten	Jane Angell		
222180	red rubber squeegie	box	Midwest Rubber		14,786	Patty Otten	Jane Angell		
51090	seal, pan side	box	Applied Power Products	Lakeville, MN	234	Patty Otten	Lorrie Dahl		
63294	seat	box, plastic bag	Seats Inc.		291	Randy Skogman	Rich Carlson		
77235	seat	box, plastic bag	Michigan Seat	Jackson, MI	944	Randy Skogman	John French		
82342	seat	box, plastic bag	Michigan Seat	Jackson, MI	266	Randy Skogman	Jane Angell		
223077	seat	box, plastic bag	Michigan Seat	Jackson, MI	884	Randy Skogman	Lauri Jorgenson		
31611	Short black hose (1" thick)	box	Parker		76	Curt Lange	Rich Carlson *		
77316	Short black hose (1" thick)	box	Parker		340	Curt Lange	Rich Carlson		
78780	Short black hose (1" thick)	box	Parker		327	Curt Lange	Rich Carlson		

Sorted by Notes Column

Appndex A: Parts Inventory

49943	Short black hose (1/2" thick)	box	Parker		1,085	Curt Lange	Rich Carlson		
361044	Short black hose (1/4" thick)	box	Cablecraft		444	Diana Meyer	Jane Angell		
77305	Short black hose (1/4" thick)	box	Parker		327	Curt Lange	Rich Carlson		
59584	Short black hose (1/4" thick)	box	Parker		520	Curt Lange	Rich Carlson		
77304	Short black tube (1/2" thick)	box	Parker		340	Curt Lange	Rich Carlson		
25649	Short clear hose, opaque string through it	box	Midwest Rubber		484	Patty Otten	Jane Angell		
75866	shroud, fan	box	VEE Engineering		132	Kwami Ahelegbe	Tom Runyon		
74063	Small foam pads	box	Applied Power Products	Lakeville, MN	391	Patty Otten	Jane Angell		
43516A	soap basket	box, level dividers	Filtertek		1,017	Kwami Ahelegbe	Tom Runyon		
16903	Sq. foam pads, donut like	box	Applied Power Products	Lakeville, MN	638	Patty Otten	Jane Angell		
72824	Square foam pads	box	Applied Power Products	Lakeville, MN	1,667	Patty Otten	Jane Angell		
222092	steering housing	shrink wrap, corners	Imperial Custom Molding	Rogers, MN	3,033	Kwami Ahelegbe			
222093	steering housing	shrink wrap, corners	Imperial Custom Molding	Rogers, MN	1,469	Kwami Ahelegbe			
222748	steering shroud	shrink wrap, corners	Imperial Custom Molding	Rogers, MN	5,088	Kwami Ahelegbe	Tom Runyon		
56398	steering wheel	big box w/ plastic bag around each wheel	TEI Group		3,258	Randy Skogman	John French		
57499	steering wheel	big box	West American		318	Randy Skogman	Duane Davis		
72991	tank	box, plastic bags, foam sheets	Centro	Iowa	346	Cindy Scheevel	Lorrie Dahl		
86926	tank gasket	box	Precision GA (Applied ?)		234	Patty Otten	Tom Runyon		
222121	tank gasket	box, cardboard level dividers	Applied Power Products	Lakeville, MN	4,781	Patty Otten	Jane Angell		
47525	tire	shrink wrap w/ cardboard dividers	Ace Products	Carlisle, PA	522	Curt Lange	Lorrie Dahl		
80148	tire	shrink wrap, cardboard level dividers	Gleason		3,676	Curt Lange	Rick Anderson		
87421	Tires	shrink wrap, level dividers	Dico		198	Curt Lange	John French		
87432	Tires	shrink wrap, level dividers	Dico		130	Curt Lange	John French		
87196	Tires	shrink wrap, level dividers	Unknown		26				
360071	Tires	shrink wrap, level dividers	Unknown		1,623	Curt Lange	John French		
53817	Tires	shrink wrap, level dividers	Ind. Tire Sal.		531	Curt Lange	John French		
360769	Tires	shrink wrap, level dividers	Ind. Tire Sal.		450				
54437	Tires	shrink wrap, level dividers	Unknown		3,925				
70287	Tires	shrink wrap, level dividers	Unknown		1,273	Curt Lange	John French		
361069	Tires	shrink wrap, level dividers	Ind. Tire Sal.		102	Curt Lange	Lorrie Dahl		
09027	Tires	shrink wrap, level dividers	Ace Products		829	Curt Lange	John French		
70278	Tires	shrink wrap, level dividers	Ind. Tire Sal.		92	Curt Lange	John French		
28546	Tires	shrink wrap, level dividers	Ace-Ohio		1,232	Curt Lange	John French		
70288	Tires	shrink wrap, level dividers	Ind. Tire Sal.		521	Curt Lange	John French		
60395	Tires	shrink wrap, level dividers	Unknown		576				
78013	U-shaped foam pad	box	Applied Power Products	Lakeville, MN	23	Patty Otten	Jane Angell		
223681	Unknown	box	Motor App.		373	Patty Otten	Lauri Jorgenson		
72159	washer	box	Minneapolis Washer	Minneapolis, MN	8,383	Curt Lange	Jane Angell		
16909	White hose	box	Midwest Rubber		381	Patty Otten	Jane Angell		
87673	wire sleeve	many boxes	Arden Fast		2,421	Curt Lange	Jane Angell		
360370	wire sleeve	many boxes	DekDuct		104	Curt Lange	Lauri Jorgenson		
NOTE: ONLY PARTS THAT ARE USED IN ASSEMBLY WERE USED IN THIS LIST BECAUSE THEY PROVIDE THE BEST OPPORTUNITY TO REDUCE SOURCE WASTE.									
ALSO, SOME PARTS THAT ARE OBSOLETE,OR SOON TO BE, WERE OMITTED.									

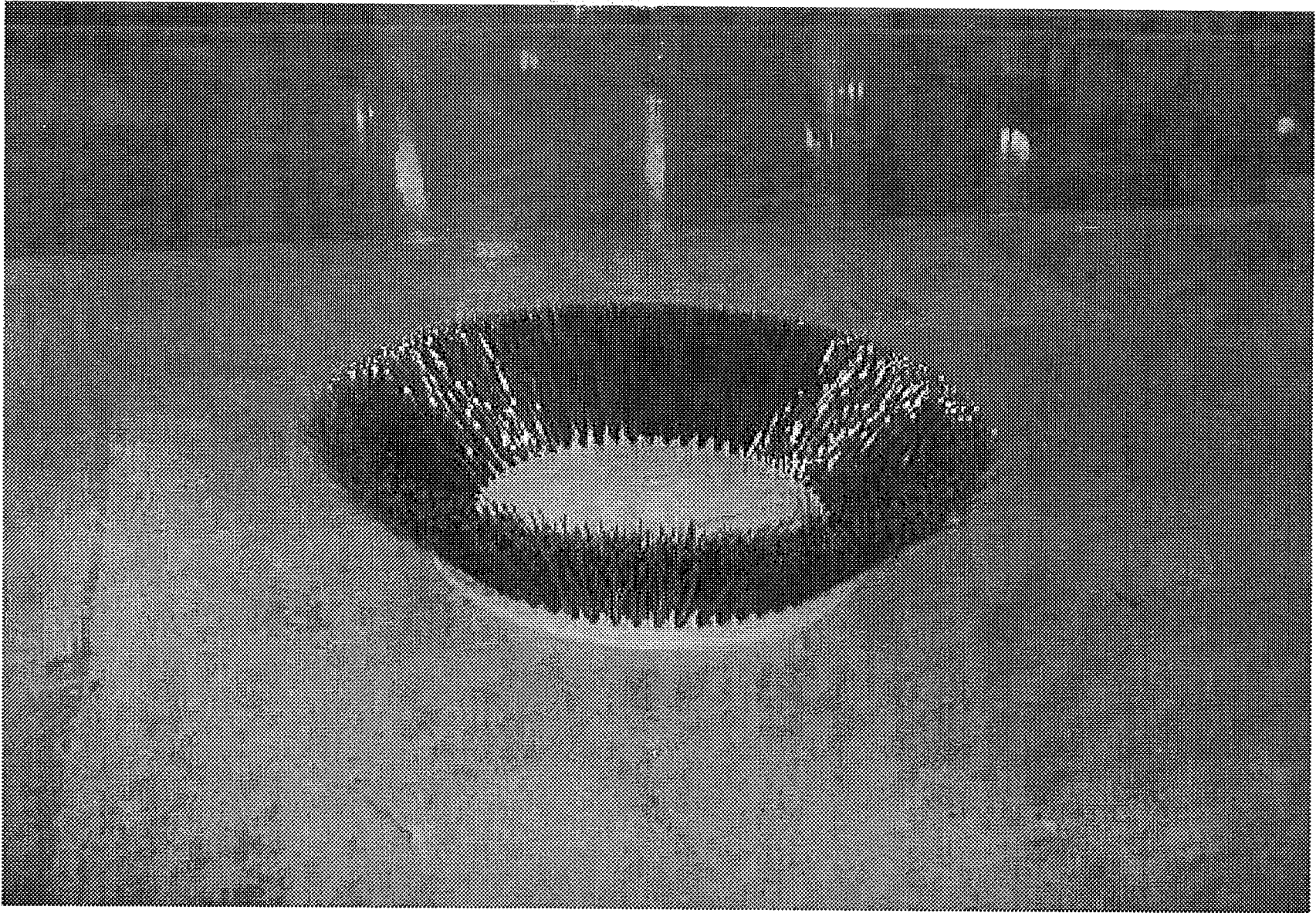
Sorted by Notes Column

APPENDIX B: BRUSHES

Side Sweep Brush Boxes



Side Sweep Brush



Tubular Brushes



Appendix B: Brush Inventory

Cost of Brushes			
Quantity	Carton Cost	Cost Per Year	
127	\$ 0.66	\$	83.82
127	\$ 0.17	\$	21.59
127	\$ 0.25	\$	31.75
114	\$ 1.50	\$	171.00
52	\$ 1.50	\$	78.00
59	\$ 1.24	\$	73.16
297	\$ 0.90	\$	267.30
177	\$ 1.20	\$	212.40
362	\$ 1.20	\$	434.40
1,463	\$ 0.95	\$	1,389.85
1,463	\$ 0.18	\$	263.34
1,463	\$ 0.66	\$	965.58
70	\$ 1.20	\$	84.00
62	\$ 3.42	\$	212.04
36	\$ 1.40	\$	50.40
1,200	\$ 1.20	\$	1,440.00
130	\$ 1.51	\$	196.30
49	\$ 1.51	\$	73.99
1,200	\$ 1.00	\$	1,200.00
1,200	\$ 0.66	\$	792.00
1,200	\$ 0.85	\$	1,020.00
5,398		\$	9,060.92
Cost of Brushes			
		Number of Brushes	
Disk	\$ 5,767.93		2,790
Tube	\$ 3,292.99		2,608
Total	\$ 9,060.92		

How Many Spools?

Part Numbers: 80042 and 59431

Lines: 355/385, 6080 and 6400

Assumptions:

- 3 Week Turn Around
- 1 Pallet Per Line Per Line Run
- 1 Line Run Equals 1 Week

Where	# of Pallets
On Assembly Line	4
In Warehouse; Plant I	12
Empty; Plant I	11
Empty; Plant II	11
Being Filled	12
Total:	50
Extras:	3
Number Spools Needed To Be Purchased:	53

Calculations

Appendix B: Brush Inventory

How Many Boxes For Tubular Brushes

Box Dimentions: 58.5"L x 40"W x 52"H

Part #	Quantity	Length (in)	Width (in)	Height (in)	# of Levels	# Brushes Per Level	# Brushes Per Box	Full Boxes Per Year
80058	1,200	9	9	24	2	6 x 4 24	48	25
41457	297	9	9	29	1	6 x 4 24	24	13
70471	59	9	9	48	1	6 x 4 24	24	3
36699	130	12	12	37	1	4 x 3 12	12	11
75718	49	13	13	51	1	4 x 3 12	12	4
54925	362	16	16	43	1	3 x 2 6	6	61
54923	177	16	16	46	1	3 x 2 6	6	30
87097	70	17	17	37	1	3 x 2 6	6	12
87099	62	17	17	37	1	3 x 2 6	6	11
66019	114	17	17	46	1	3 x 2 6	6	19
35324	52	19	19	51	1	3 x 2 6	6	9
35326	36	19	19	51	1	3 x 2 6	6	6

Calculations

Appendix B: Brush Inventory

Part #	Quantity	Carton	Carton \$	Weight (lb)	Length (in)	Width (in)	Height (in)	Hole Size (in)	Bin Loc.	Status
35324	114	48284-8	1.50	33	19	19	51			
35326	52	48284-8	1.50	31	19	19	51		L17Q1	
36699	59	48284-14	1.24	12	12	12	37		L14E1	
41457	297	48284-16	0.90	7	9	9	29		L15G1	
54923	177	57795	1.20	26	16	16	46		L16J1, J08A1	
54925	362	57795	1.20	27	16	16	43		L16G1, J08A1	
59431	1,463	45728-1	0.95	10	26	27	7		L20D1, J12C3	
59431	1,463	61398	0.18	Total Packaging Cost per Part:			\$ 1.79			
59431	1,463	08014	0.66							
66019	70	57795	1.20	27	17	17	46		L16L1, J08E1	
70471	62	70508	3.42	9	9	9	48		L21G1	
75718	36	48284-15	1.40	28	13	13	51		L17D1	
80058	1,200	80044	1.20	7	9	9	24		L21F1, J12G1	
80042	1,200	80361	1.00	5	18	18	6			
80042	1,200	80362	0.66	Total Packaging Cost per Part:			\$ 2.51			
80042	1,200	80363	0.85							
87097	130	48284-1	1.51	22	17	17	37			
87099	49	48284-1	1.51	20	17	17	37		L17F1, J08C1	
28096P	127	45772	0.66	4	18	18	5			
28096P	127	45772-5	0.17	Total Packaging Cost per Part:			\$ 1.08			
28096P	127	61399	0.25							
Total:	5,398		\$ 9,061							
NOTE: ONLY PART #'S THAT ARE USED										
IN ASSEMBLY WILL BE HERE!										
The brushes for the 6080 are the projected numbers for next year										

Sorted by Part Number

Appendix B: Brush Inventory

Part #	Quantity	Carton	Carton \$	Weight (lb)	Length (in)	Width (in)	Height (in)	Hole Size (in)	Bin Loc.	Status
59431	1,463	45728-1	0.95	10	26	27	7		L20D1, J12C3	
59431	1,463	61398	0.18	Total Packaging Cost per Part:			\$ 1.79			
59431	1,463	08014	0.66							
80042	1,200	80361	1.00	5	18	18	6			
80042	1,200	80362	0.66	Total Packaging Cost per Part:			\$ 2.51			
80042	1,200	80363	0.85							
80058	1,200	80044	1.20	7	9	9	24		L21F1, J12G1	
54925	362	57795	1.20	27	16	16	43		L16G1, J08A1	
41457	297	48284-16	0.90	7	9	9	29		L15G1	
54923	177	57795	1.20	26	16	16	46		L16J1, J08A1	
87097	130	48284-1	1.51	22	17	17	37			
28096P	127	45772	0.66	4	18	18	5			
28096P	127	45772-5	0.17	Total Packaging Cost per Part:			\$ 1.08			
28096P	127	61399	0.25							
35324	114	48284-8	1.50	33	19	19	51			
66019	70	57795	1.20	27	17	17	46		L16L1, J08E1	
70471	62	70508	3.42	9	9	9	48		L21G1	
36699	59	48284-14	1.24	12	12	12	37		L14E1	
35326	52	48284-8	1.50	31	19	19	51		L17Q1	
87099	49	48284-1	1.51	20	17	17	37		L17F1, J08C1	
75718	36	48284-15	1.40	28	13	13	51		L17D1	
Total:	5,398		\$ 9,061							
NOTE: ONLY PART #'S THAT ARE USED										
IN ASSEMBLY WILL BE HERE!										
The brushes for the 6080 are the projected numbers for next year										

Sorted by Quantity

Appendix B: Brush Inventory

Part #	Quantity	Carton	Carton \$	Weight (lb)	Length (in)	Width (in)	Height (in)	Hole Size (in)	Bin Loc.	Status
28096P	127	45772	0.66	4	18	18	5			
80042	1,200	80361	1.00	5	18	18	6			
41457	297	48284-16	0.90	7	9	9	29		L15G1	
70471	62	70508	3.42	9	9	9	48		L21G1	
59431	1,463	45728-1	0.95	10	26	27	7		L20D1, J12C3	
36699	59	48284-14	1.24	12	12	12	37		L14E1	
87099	49	48284-1	1.51	20	17	17	37		L17F1, J08C1	
87097	130	48284-1	1.51	22	17	17	37			
54923	177	57795	1.20	26	16	16	46		L16J1, J08A1	
54925	362	57795	1.20	27	16	16	43		L16G1, J08A1	
66019	70	57795	1.20	27	17	17	46		L16L1, J08E1	
75718	36	48284-15	1.40	28	13	13	51		L17D1	
35326	52	48284-8	1.50	31	19	19	51		L17Q1	
80058	1,200	80044	1.20	7	9	9	24		L21F1, J12G1	
35324	114	48284-8	1.50	33	19	19	51			
Total:	5,398		\$ 9,061							
NOTE: ONLY PART #'S THAT ARE USED										
IN ASSEMBLY WILL BE HERE!										
The brushes for the 6080 are the projected numbers for next year										

Sorted by Brush Weight

Appendix B: Brush Inventory

Part #	Quantity	Carton	Carton \$	Weight (lb)	Length (in)	Width (in)	Height (in)	Hole Size (in)	Bin Loc.	Status
28096P	127	45772	0.66	4	18	18	5			
80042	1,200	80361	1.00	5	18	18	6			
59431	1,463	45728-1	0.95	10	26	27	7		L20D1, J12C3	
80058	1,200	80044	1.20	7	9	9	24		L21F1, J12G1	
41457	297	48284-16	0.90	7	9	9	29		L15G1	
36699	59	48284-14	1.24	12	12	12	37		L14E1	
87097	130	48284-1	1.51	22	17	17	37			
87099	49	48284-1	1.51	20	17	17	37		L17F1, J08C1	
54925	362	57795	1.20	27	16	16	43		L16G1, J08A1	
54923	177	57795	1.20	26	16	16	46		L16J1, J08A1	
66019	70	57795	1.20	27	17	17	46		L16L1, J08E1	
70471	62	70508	3.42	9	9	9	48		L21G1	
35324	114	48284-8	1.50	33	19	19	51			
35326	52	48284-8	1.50	31	19	19	51		L17Q1	
75718	36	48284-15	1.40	28	13	13	51		L17D1	
					9" diameter	< 9" diameter				
					1,559	1,049				
Total:	5,398		\$ 9,061							
								#/cntr.	# filled/yr.	
NOTE: ONLY PART #'S THAT ARE USED					Total For Spools:		2,790	14	199	
IN ASSEMBLY WILL BE HERE!					Total For Racks:		2,406	12	201	
					Total For Boxes:		202	6	34	
The brushes for the 6080 are the projected numbers for next year										

Sorted by Brush Height

APPENDIX C: IMPERIAL CUSTOM MOLDING

Imperial Custom Molding Boxes



Appendix C: Imperial Custom Molding

Imperial Custom Molding

Feasibility Assessment Prepared By: Kathryn M. Peterson (612) 540-1407

Tenant Purchasing Agent: Tom Runyon (612) 424-1349

Imperial Custom Molding Contact: Steve Jenkins (612) 428-8310

Only parts that will return a tote at least once a month should be considered as candidates for tote use, at this time.

<u>Tenant Part #</u>	<u>Description</u>	<u>Box Size (cube)</u>	<u>Boxes Per Year</u>	<u>Totes Per Year</u>	<u>Cost Per Year</u>
222027	Lift, Head	12	76	25	\$ 76.00
222034	Bracket, Guide, Roller	18	56	56	\$ 70.00
222186	Housing, Control Lever	16	23	18	\$ 28.75
222191	Cover, Solution Tank	16	186	143	\$ 232.50
222244	Cam, Adjustment	10	84	17	\$ 84.00
23456	Cap, Drain	20	68	102	\$ 136.00
41573	Output Duct	16	24	19	\$ 30.00
41574	Input Duct	18	18	18	\$ 22.50
43463B	Brush Flange	20	181	272	\$ 362.00
45962	Cover, Terminal	16	24	19	\$ 30.00
57751	Boot, Circuit Breaker	12	64	22	\$ 64.00
80025	Wheel, Hub	18	36	36	\$ 45.00
80043	Brush Back	20	20	30	\$ 40.00
80047	Arm, Brush, Driver	20	12	18	\$ 24.00
80424	Arm, Brush, Idler	20	24	36	\$ 48.00
86075	Housing, Inlet, Vac. Fan	16	20	16	\$ 25.00
86636	Cover, Lid	16	17	14	\$ 21.25
Totals:			933	861	\$ 1,339

<u>Box Size</u>	<u>Cost Per Box</u>
10 x 10 x 10	\$ 1.00
12 x 12 x 12	\$ 1.00
14 x 14 x 14	\$ 1.25
16 x 16 x 16	\$ 1.25
18 x 18 x 18	\$ 1.25
20 x 20 x 20	\$ 2.00

Appendix C: Imperial Custom Molding

	Schaefer (#1)	Orbis (#2) (Partially Collapsible)	Orbis (#3) (Totally Collapsible)
Dim. LxWxH (Outer):	23.7 x 15.8 x 16.6	24 x 15 x 16.3	24 x 15 x 14.7
Dim. LxWxH (Inner):	22.2 x 14.5 x 16.5	22.5 x 13.6 x 16	22.5 x 13.6 x 14.4
Collapsed Height:	3.5	10	3.5
Each Tote:	\$ 47.25	\$ 21.55	\$ 24.49
360 Totes:	\$ 17,010	\$ 7,758	\$ 8,816
Hot Stamp (total):	\$ 445	\$ 373	\$ 373
Includes:			
Die (one time)	\$ 175	\$ 175	\$ 175
2 stamps / container	\$ 0.75	\$ 0.55	\$ 0.55
Card Holders	N/A	\$ 162	\$ 162
Total Initial Invest.:	\$ 17,455	\$ 8,293	\$ 9,351
Pay Back Time (years):	13.0	6.2	7.0
400 Totes:	\$ 18,900	\$ 8,620	\$ 9,796
Hot Stamp (total):	\$ 475	\$ 395	\$ 395
Includes:			
Die (one time)	\$ 175	\$ 175	\$ 175
2 stamps / container	\$ 0.75	\$ 0.55	\$ 0.55
Card Holders (\$0.45 each)	N/A	\$ 180	\$ 180
Total Initial Invest.:	\$ 19,375	\$ 9,195	\$ 10,371
Pay Back Time (years):	14.5	6.9	7.7

Return Shipment: \$ 1,050 per year
Savings: \$ 289 per year (excluding initial investment)

NOTE: any parts in the bulk pull system could remain in these containers to reduce material handling.

I think that option #3, the Orbis totally collapsible containers, are the most cost effective option that would still fulfill all of the goals of the project. Option #3 would fit on Tennant pallets, 30W x 48L, very well. There could be 4 to a layer and 3 layers per pallet.

Appendix C: Imperial Custom Molding

Hot stamping is important because it helps prevent containers from getting lost or accidentally thrown away. Two stamps are a good idea because there can be 1 stamp on the side, visible when it is full, & 1 stamp on the cover, more visible when it is collapsed. The card holders are necessary because they allow cards with bar codes to be placed in them so that it is easy to keep track of the parts.

The economic data should not be the only thing that is considered when deciding if Tennant should purchase these totes. Then impact on the environment is also important. Less cardboard will have to be made and less will have to be handled by both companies. Also these totes should last indefinitely because of their sturdy construction.

360 totes would be a minimum. Tennant may want to consider purchasing more, 400, to account for later part development or increased part usage. This would be beneficial because buying more at one time decreases the cost of the totes. Imperial would like to see these delivered in installments of about 100 so that they can be phased in and not have to take up storage space while they are waiting to go into the system. The return shipment is calculated assuming that the totes will be returned every 1 1/2 weeks at \$30 per van trip. This should insure a smooth running system.