Reducing Energy Use and Oil Mist Generation

Roberts Automatic

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Company Overview (Not for Roberts Presentation)

- Metal parts manufacturing job shop
  - Automotive
  - Aerospace
  - Consumer

- Automatic machines
  - High production
  - High precision
MnTAP Overview

- Minnesota Technical Assistance Program
  - University of Minnesota outreach program
- Services for Minnesota businesses
  - Minimize waste and pollution
  - Resource efficiency
  - Energy reduction
- Intern program
Motivations for Change

• Production is down – energy overhead costs significant

• Physical evidence of oil misting

• Facility equipment is aging
Reasons for MnTAP Assistance

• Identify and improve large energy consumers

• Quantify and reduce oil mist levels

• Incentives for replacing equipment

• Better understanding of ventilation
**Approach**

- Energy consumption audit, 2,300,300 kWh annually
Approach

• Measured oil mist levels

• Identified air treatment equipment
  - Mist collectors
  - Air cleaners
  - HVAC
Determining Inefficient Processes

• Leak test
• Datalogging
• Effectiveness of air treatment equipment
• Compressed air requirements
• Air balance
• Spoke to service technicians
Compressed Air Controls

• Background
  - Adjusts volume of air produced
  - Two compressors

• Problem
  - Modulation inefficient
Compressed Air Controls

• Solution
  - Tested load/unload operation on larger unit
  - Equipment improvement
Oil Mist Generation

• Problem
  - 40 CFM, 17% capacity
  - No repair routine
• Solution
  - Leak tag system
• Realizing repairs
  - 50 HP, $500/yr
  - 75 HP, $1,000/yr
  - VSD, $1,500/yr
Weekend Air Compressor Use

- **Background**
  - Stays on for “lights out” shift

- **Problem**
  - High cost for small air volume

- **Solution**
  - Use smaller compressor
  - Master switch for shutdown
Oil Mist Generation

• Background
  - OSHA PEL = 5.0 mg/m$^3$
  - NIOSH REL = 0.5 mg/m$^3$

• Problem
  - Visible haze, odor, slippery floors, exposure

• Solution
  - Evaluate current levels
  - Find and reduce high sources
Oil Mist Generation

Average: 0.355 mg/m³
Max: 0.534 mg/m³
Oil Mist Generation

• High sources
  - CNC chip conveyors exits, 15.0 mg/m³
  - Acme mach. 16, 23.0 mg/m³
  - Integrex conveyor, 30.0 mg/m³

• Mist collector good practices
  - Relocate units as jobs change
  - Block unused hoses
  - Davenport door positioning
Oil Mist Generation
Ventilation

• Air-cooled condenser exhaust
  - Continuous 6,000 CFM exhaust
  - 0.4 air changes/hr
  - Cooling costs $400/yr
  - Design intent

• Compressor room manual louver
  - Heat recovery
  - Cooling costs $1,500/yr
  - Rooftop unit alternative
Successful Process Changes (Style 1)

• Small compressor for weekend use
  - $2,000/yr saved
• Recommended leak tag method
  - Potential $500-$1,000 /yr savings
• Identified oil mist contributors
  - Sources as high as 30 mg per cu. meter
Successful Process Changes (Style 2)

• Implemented estimated savings
  - $ _____
• Long-term potential savings
  - $ ______
• Mist reduction
  - _____ mg/hour oil (need to do more work to determine this figure)
Personal Benefits

- Project ownership
- Experience in a new industry setting
- Hands-on data collection, testing
Questions?