

Energy Reduction Evaluations for Industrial Facilities



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Randy Lorenz has more than 27 years expertise in design of utility plants, chilled water systems, large compressed air systems, industrial ventilation, process utility design, heating, ventilation, air conditioning, control system design and fire protection systems. He has extensive experience in the energy performance and retro-commissioning projects. Randy has served as a project manager and project engineer to several major industrial clients for a variety of utility, facility and process design projects. He currently serves as the Director of Engineering at Sebesta Blomberg. In this capacity, he is responsible for overseeing all phases of work in these areas, as well as technical and quality review of projects, client relationships and staff development.



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Sebesta Blomberg

Sebesta Blomberg provides technical and business solutions that improve operational efficiency, enhance the quality of the work environment and reduce the cost of facility operation.

Headquartered in Minneapolis-St. Paul, with offices strategically-located throughout the United States, including Austin, Boston, Cedar Rapids, Chicago, Dallas, Houston, Washington D.C., and West Palm Beach.



Quick Facts:

Founded in 1994

200 employees

Ranks as an ENR Top 500 Engineering Firm

Over 87% of our business is repeat

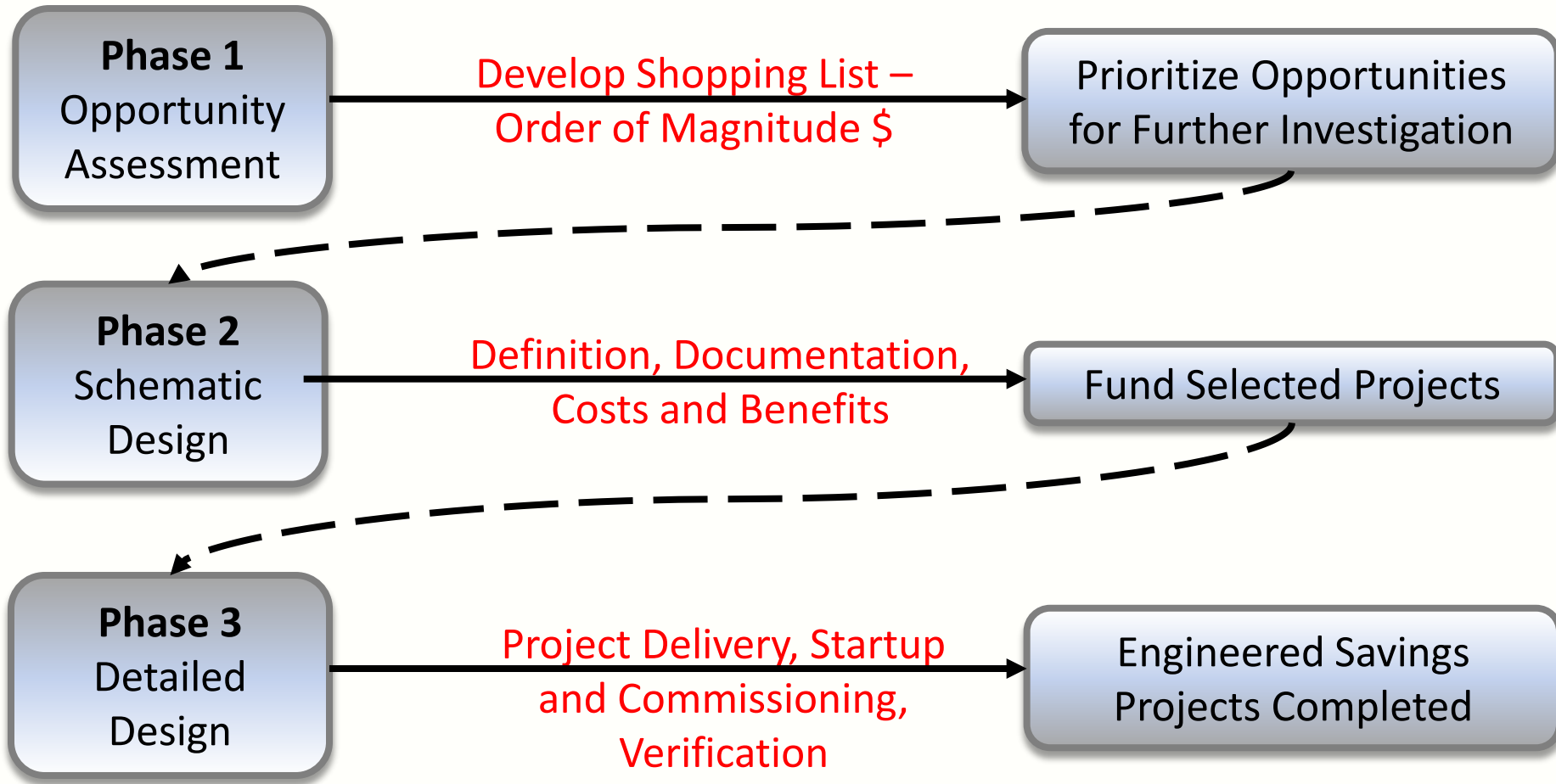
Sebesta Blomberg & Associates, Inc. (Sebesta Blomberg), has been commissioned by **major industrial clients** to create and validate **Engineered Energy Saving Projects**.

The goal of the Engineered Energy Savings Projects are to improve indoor environment, operating efficiency and energy optimization.

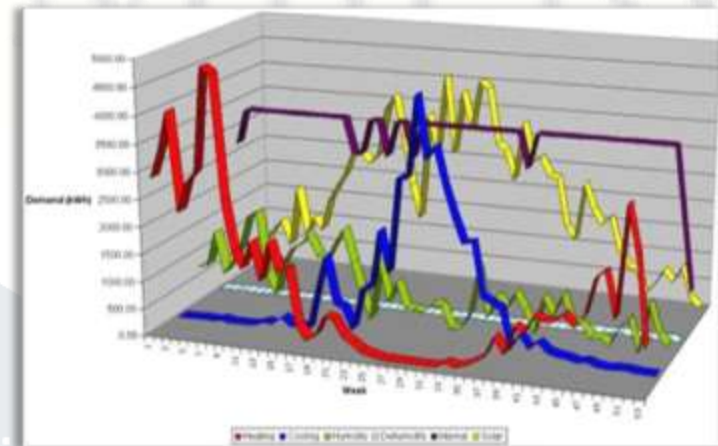
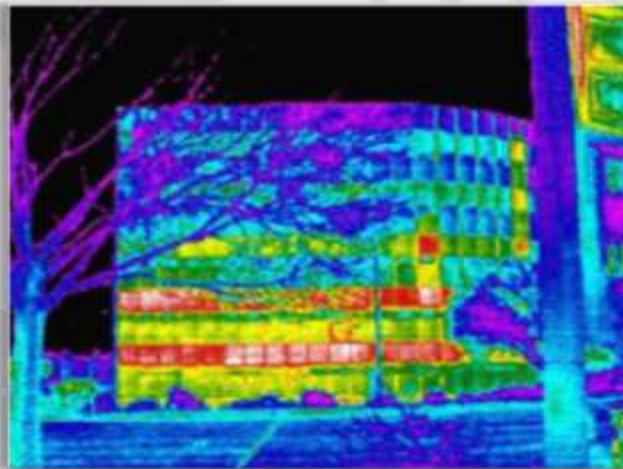
- An integrated program that includes energy cost reduction, value-added capital expenditures, process improvements and optimizing existing assets
- An opportunity assessment process that stresses define, measure, analyze, improve and control
- Performed by independent professional that is familiar with manufacturing processes and procedures
- Program can be plant-wide in scope or targeted for specific utility, system or process

- Commitment of plant and consultant resources
- Hands-on plant walk-through and interviews with appropriate staff
- “Shopping list” of valid potential projects for plant-wide assessments
- Solutions with costs, benefits and plant impact for targeted assessments
- Accurate project definition
- Secure funding for priority work

Open Season on Identifying Improvements



- Measurement
- Interviews
- Analysis



Examples of significant Engineered Energy Savings projects

- Reducing exhaust air/make up air
- Re-evaluate space usage/requirements
- Analyzing humidification levels
- Compressed air system energy savings
- Chilled water energy reduction
- Other possible ideas

Industrial Ventilation

Sample Opportunities

- Effectively reduce the general room or fugitive exhaust rates and put more emphasis on source exhaust
- Existing ventilation systems may be operating under the past design guidance
- A change of use in areas so considered re-classifying

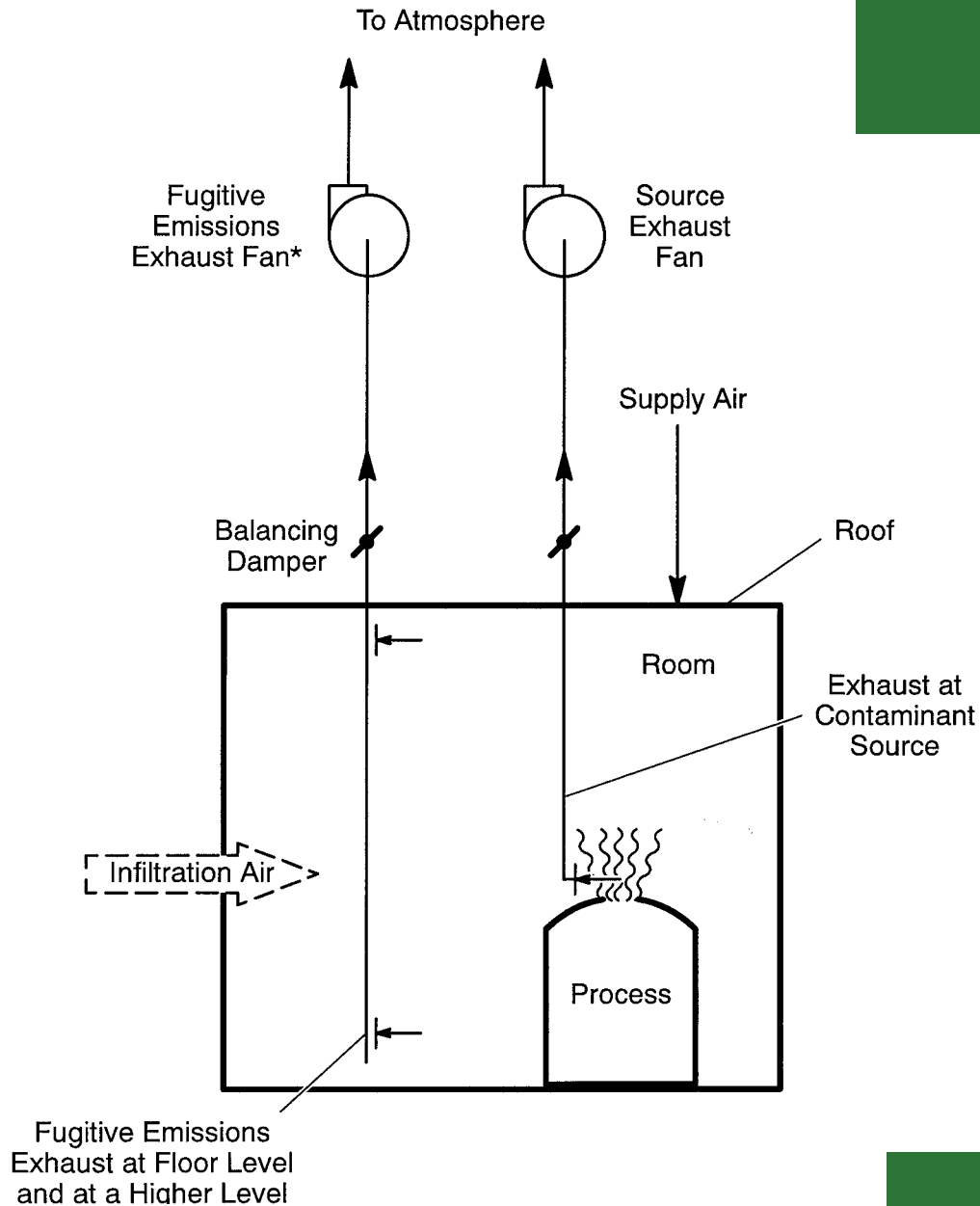
Solvent Solution Handling Area

- Provided re-engineering services
- Evaluated existing ventilation and exhaust system design
- Reduce fugitive emissions ventilation rate within the dispensing and mixing areas
- Upgrading /adding source exhaust to capture hazardous fumes at the point of use
- Reduced supply and exhaust by more than 50%

Energy Reduction Evaluations for Industrial Facilities

Industrial Ventilation

Typical Air Flow Diagram



* Systems may have a single-fan design for combined process and fugitive emissions exhaust, or a double-fan design with one fan dedicated to fugitive emissions exhaust. A dedicated fan for fugitive emissions may reduce the power requirements for standby/emergency power equipment. Depending on local codes and standards, and process hazard analysis, system configurations may differ from the one presented here.

Results

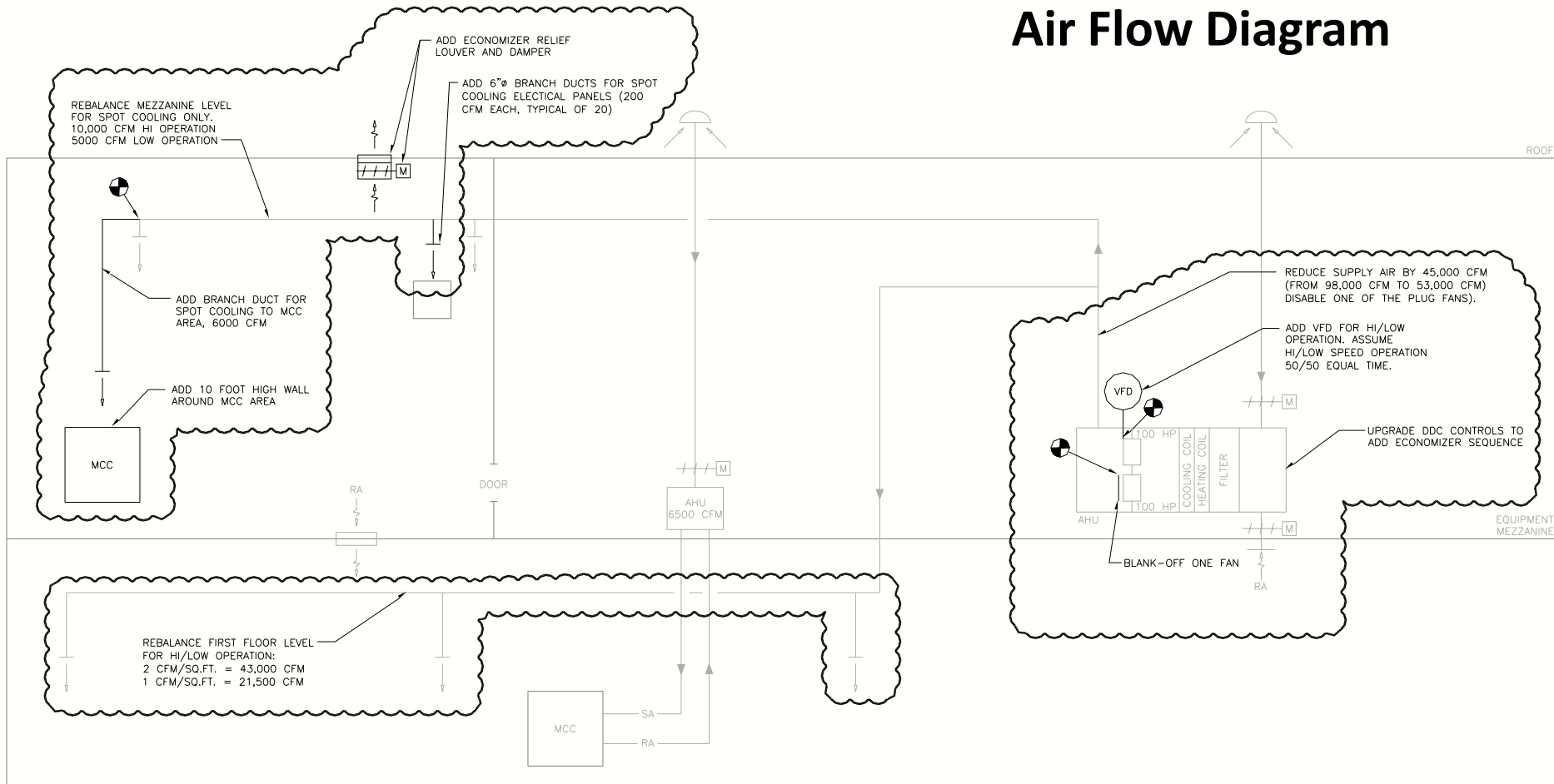
- *Annual energy cost reduction of over \$190,000*
- Payback of less than 5 months
- Improvement in environmental conditions
- Reduced steam, humidification and electrical usage
- Decreased cooling, heating, and humidification peaks

Evaluation of Current Process Requirements

Manufacturing Line

- Original HVAC design accommodated hazardous chemicals. Process only used water based solvents.
- Reduced the ventilation rate in process area to provide adequate cooling and pressurization
- Provide VFD for air handling unit supply fan motor to operate based on process operation
- Reduce air flow rate within the MCC penthouse to provide spot cooling instead of cooling the entire room

Air Flow Diagram



Results

- Reduce total air flow rate by 50% (>100 HP)
- Reduce outdoor air requirements and added return air capabilities
- Allowed system to operate in the outdoor air free-cooling economizer mode
- Reduced cooling loads with spot cooling

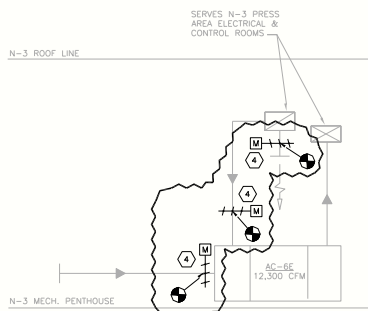
- Steam savings – 2,600,000 MMBtu (peak boiler load reduced by 2,800 lbs/hr)
- Chilled water savings – 1,500,000 ton/hrs (peak chiller load reduced by 330 tons)
- Fan energy savings – 286,000 Kwh
- Projected payback is 1.1 years
- Delayed capital expenditures

Economizer Upgrades

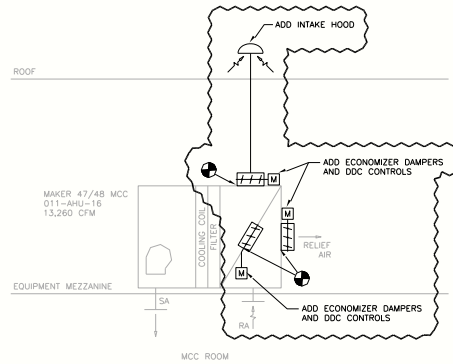
MCC Rooms

- Modify air handing units serving MCC electrical rooms to operate with an outdoor air free-cooling economizer mode
- Upgraded outdoor/relief air dampers to modulate between the 100% open condition and fully closed
- Upgraded control systems

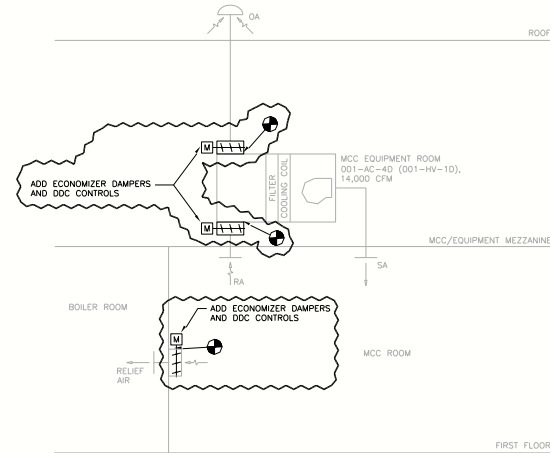
Flow Diagrams



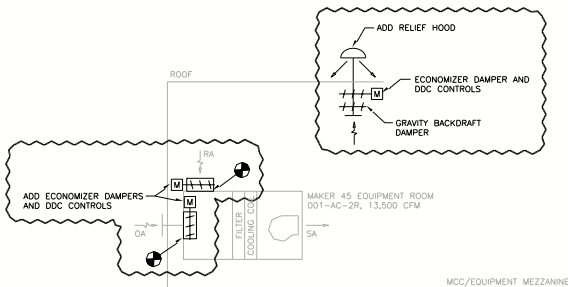
N-3 PRESS AREA MCC – AC-6E
 AIR FLOW DIAGRAM



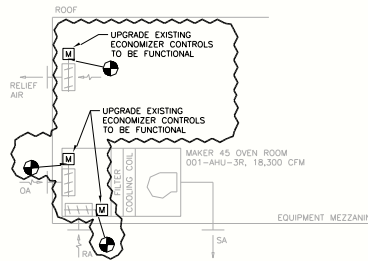
MAKER 47/48 MCC ROOM
 011-AHU-16
 AIR FLOW DIAGRAM



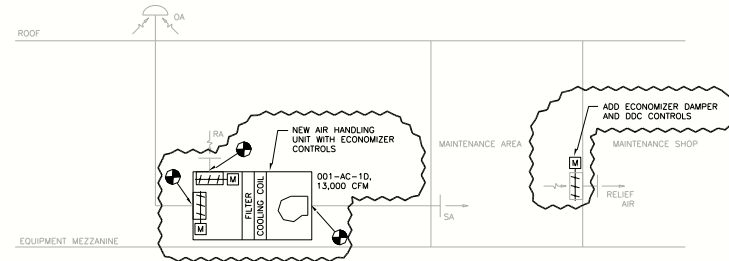
MCC EQUIPMENT ROOM
 001-AC-4D (001-HV-1D)
 AIR FLOW DIAGRAM



MAKER 45 EQUIP. ROOM
 001-AC-2R
 AIR FLOW DIAGRAM



MAKER 45 OVEN ROOM
 001-AHU-3R
 AIR FLOW DIAGRAM

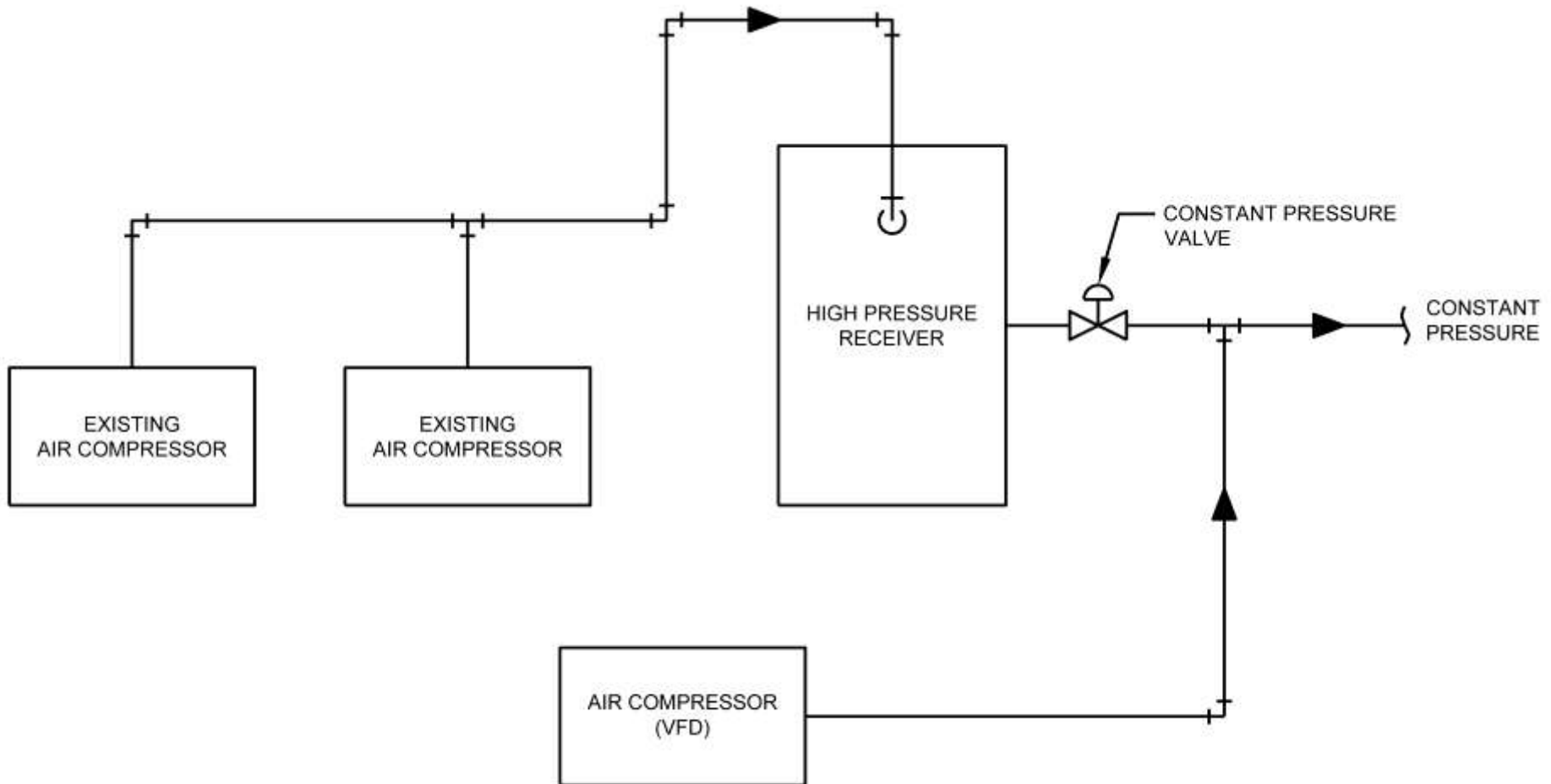


MAINTENANCE AREA
 001-AC-1D
 AIR FLOW DIAGRAM

Results

- Projected payback is 2.7 years
- Projected chilled water savings – 954,000 ton/hrs (peak chiller load reduced by 0 tons)
- The energy savings are in the form of reducing chilled water usage for cooling by using outdoor air economizer
- Minimal or no down time required

Compressed Air System Savings



Real Opportunities

- Decrease in the artificial compressed air demand by reducing pressure. 25 HP for every 100 scfm saved
 - Use constant pressure control
 - Invest in VSD compressors
 - Eliminate unregulated users
 - Fix leaks
 - Automation of the compressed air system utilizing programmable logic controllers

Real Opportunities

- Decrease overall system pressure. Increase of one psi in systems pressure increases the on line compressor horsepower by 0.5%
- Size end use components for the rate of flow
- Loop compressed air piping
- Eliminate unneeded pressure reducing valves
- Ability to gain back redundancy by shutting down unneeded compressors

Process Chilled Water

Chilled water is integral with the manufacturing operation. Used in direct process cooling applications and to condition the production areas.

Opportunities

- System Delta T's a problem
- Chilled water set points based on comfort cooling not process needs
- Spot cooling applications
- Use other cooling methods if possible

Savings

- Tower water reset (net of 1% compressor energy savings for every degree of approach)
- Add tower capacity
- Closed loop cooling systems in lieu of chilled water cooling
- Chiller's true performance NPLV

Reduce Humidification Set Point

Process Humidity Problem

- Provide a more effective method of humidifying inside the process enclosures
- Reduce humidity level set point in area surrounding the process enclosures from 50% RH to 25% RH
- Improve the control and stability of the humidification
- Proper location of humidity sensor

Results

- Approximate payback is 1.7 years
- The energy savings are in the form of reducing of steam usage for humidification
- Eliminated corrosion issues outside of enclosures
- Reduced maintenance costs

Other Potential Energy Savings

Summary of Other Energy Savings Ideas

- Replace low pressure compressed air applications with blowers or single stage compressors
- Adjust speed of control valves of instantaneous water heaters
- Change 3-way chilled water control valves to 2 way
- Lifecycle Cx

- ✓ Customized, collaborative, creative approach
- ✓ Successful, relevant experience
- ✓ Dedication/passion for energy performance and sustainability

