Colorado School of Mines
Heating Plant

Andrew Mudd, Colorado School of Mines
Campus Steam

• Under Capacity
• Reliant on 3rd Party
• Rising Expenses
• Supply Line imminent failure

Heating Plant

• Old and Failed Equipment with asbestos
• State mandated building audit score less than 60%
History

Original 1948 Plant lay out
1971 Remodel
1971 Remodel

• 1971 campus was over capacity with zero redundancy. Every new building was being built with a self-serving boiler
• 1971 first remodel; estimated cost $226,000
• Replaced old Babcock and Wilcox boilers with two 40,000 lb./hr Riley water tube boilers
• Installed new deaerating feed tank
• Decommissioned use of coal and use natural gas
• Operated continuously for 11 years before purchasing steam from Coors Brewery
Coors Builds Steam Line Through Golden

- 1982 Coors was operating a COGEN (CHP) Plant. Their discharged process steam was piped approximately 1/4 mile through downtown Golden
Investigating Options

- Consulting Engineering Firms in 2012
- Steam Distribution Study and CHP Study conducted
- CHP not economically feasible (too expensive)
- Personnel
- Real Estate
- Matching existing steam load with existing electric load (absorption chillers installed throughout campus)
CHP (Combined Heat and Power) Analysis

Figure 4: Centaur 40 Power Profile

Figure 5: Centaur 50 Power Profile
Construction

• Commenced in 2016
• Operational equipment without a roof through winter
• Operating on Coors Steam through start up and commissioning
• Installing temporary DA shed in the parking lot
• Contractor feuds cause multiple delays in the project
Removal of Old DA Tank for Temporary Install
No Roof for 2016/2017 Winter
Concrete Insulating Blankets

Installed to keep operational steam piping safe during cold weather.
Keeping Coors Steam Supply Line Warm

The Coors supply line was kept on a slow bleed to keep from going cold during commissioning.
Being Respectful Neighbors
Construction Complete
Using Technology

- Plant operates automatically; starting/stopping equipment based on load/demand
- Individual equipment controls integrated with Master Plant control
- Phone alarm dialers in plant and in strategic points in the steam distribution system
- PLC controls allow remote view and operation of the plant
- Extra safety measures utilized in order to mitigate risks from operating unmanned
PLC Controls
Cost Savings Analysis

• Coors Steam $13.11 per 1000 lbs. steam
• Heating Plant Steam $6.14 per 1000 lbs. steam
• 1st year savings over $0.5 million including staff salaries and benefits
Efficiency is Our Mission

- Daily efficiency monitoring BTU in BTU out
- 98% condensate return
- Monthly trap maintenance
- Annual insulation refurbishment
- Peak shaving gas usage
- Make-up water savings by installing a Condensate Polisher
Preparing for the Future

• Increasing steam distribution capacity for new construction on campus
• Replacing 70,000 lb./hour boiler with new/updated controls to integrate into system
• Completing end of campus steam loops for steam supply redundancy
• Upgrades for easier maintenance and operation
Questions?