Continuous Energy Improvement at Chevron Phillips Orange Plant

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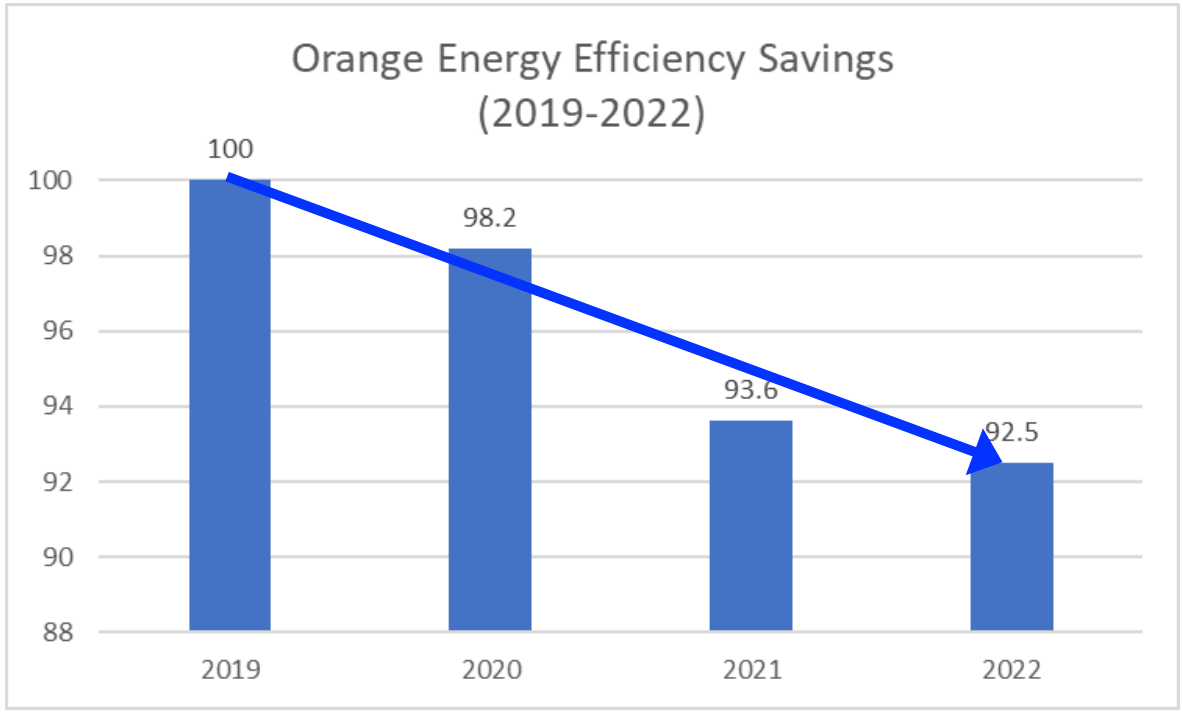
Orange Site Overview

- Site in operation since 1955
- Two high density polyethylene reactors
- Energy index record keeping began 2008
- 2022 was lowest energy index since 2008

Continuous Energy Improvement Overview

- 2022 primary energy reduction – installation of flare heating value controls
- Steam & condensate improvements
  - Steam leaks repairs
  - Replaced 15% of steam traps
  - New trap management program
  - Installation of 2 steam separators
  - Condensate improvement project
    - New System allows site to recycle condensate to several tempered water systems
- Openly share new ideas in energy best practice team meetings



Flare Heating Value Control Improvements

- Flare fuel heating value optimized by installing controls
  - Previously had a complete manual system without a control valve
- Flare fuel gas & other utilities closely monitored in morning meetings
  - Operational adjustments made when usages appear abnormally high
- Tracking & monitoring critical to finding easy reductions

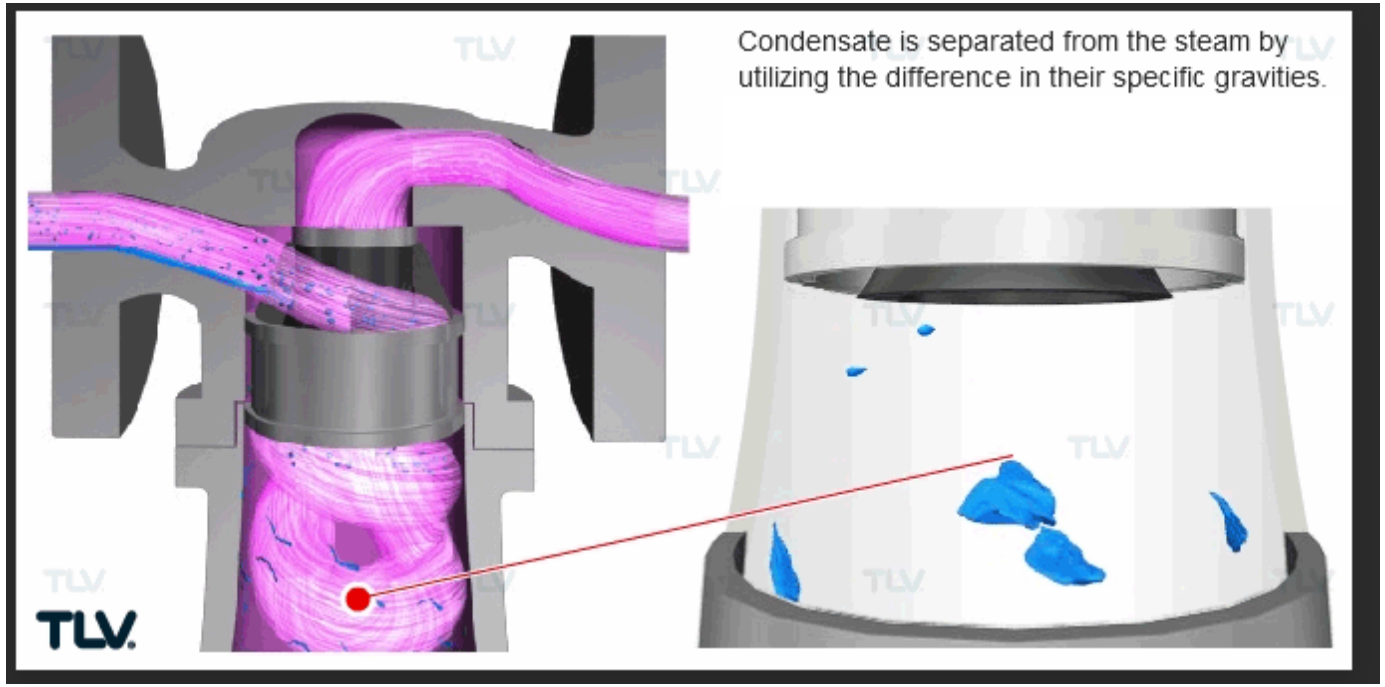
Steam Separator Project

Situation – Wet Steam to Site

- 3rd party supplier: 4,000 feet of pipe
- Trap replacements could not solely solve issue
- High frequency of steam trap failures
  - Existing traps overwhelmed

Solution – Install Steam Separators

- Separator on both 220# steam supply headers
- Removal of entrained condensate
  - 98% efficiency; similar to a centrifuge
  - Drier steam than traps alone
- Project implemented during 2022 Steam Outage



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Results - Drier Steam Downstream of Separators

- Improves steam trap reliability
- Reduces piping and equipment erosion from wet steam
- Reduces risk of steam hammer
- System flexibility to handle increase condensate loads during:
  - Start-up – higher steam flow rates
  - Potential upstream steam trap failures

TLV Steam Trap Management Program

Situation - No Formal Program

- High steam trap failure rates
  - **2022 Survey 53% traps had an issue**
- No maintenance program for repairs
- No systematic prioritized plan for identified repairs

Solution - Holistic Steam Trap Program

- Trap evaluation & model selection conducted by 3rd Party engineer
- Review entire system application - trap, bypass, & blowdown valves
- Identify locations where traps are missing
- Database created with information needed for maintenance
  - Faster repair process with less planning required
- Program prioritizes repairs to reduce future failures
- Maintenance to be performed by nested contractor

Expected Results

- **Program target is to reduce steam trap failures to <8% in 5 years**
- Reduce steam trap maintenance & operating expenses
- Provide a platform for sustainability & continuous improvement
- 4Q 2023 initial survey & on-line repairs complete

Key Takeaways

- Support from management is critical
- There must be an assigned leader
  - Gather & track data
  - Take the lead on energy projects
  - Time to investigate savings opportunities
  - Prepare for upcoming opportunities
    - Survey
    - Plan the repairs
    - Execution
- Step further - collaboration between site energy leads
- Training opportunities for ops & maintenance

Questions

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