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ExxonMobil GEMS Baytown Olefins Plant Back to the Basics

A Systematic Approach to Energy Conservation

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Taking on the world's toughest energy challenges.™

GEMS: Three Core Objectives

- **Operate existing facilities more efficiently through improved work practices**
- **Identify investment opportunities to employ new facilities and technology**
- **Sustain results through focused measurement, accountability, and continuous improvement**

Methodology: Operational Efficiency

- Engineers implemented hundreds of Key Energy Variables (KEV's) for each site based on GEMS best practices
- Examples include compressor suction and discharge pressure, steam injection into fired heaters, and process recycles
- Lost opportunity calculated based on deltas from target is used to optimize daily operation and drive projects implementation
- KEV targets based on best-in-class performance are tightened when new technology/facilities are available

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Methodology: New Investment

- Initial project ideas are generated by a team of ExxonMobil specialists and site personnel performing rigorous assessments at each site
- Plant personnel continuously evaluate and develop new project ideas
- Each site develops a prioritized multi-year project implementation plan
- Projects that require low or no investment are often given priority

Methodology: Sustainment

- KEV lost opportunity is reviewed with technical, operations, and management personnel
- Sites use real-time lost opportunity calculations to maximize response capability
- Energy efficiency metrics are calculated and routinely stewarded against plan
- Participation in industry-wide efficiency surveys allows comparison of energy performance to similar operating plants around the country and the globe

Low / No Cost Savings

- The Baytown Olefins Plant received an American Chemistry Council Energy Efficiency Award for its "Back to the Basics" energy plan executed in 2004
- The goal of this plan was to find cost-effective energy opportunities by tightening targets and challenging conventional operating strategies
- Focus was placed on identifying energy consumption that provided no useful work. A few examples follow:

Case 1: Refrigeration Optimization

Opportunity: Minimize compression energy

Hurdle: Complicated operation (optimizing 1st and 3rd stage suction pressure) and concern over new control strategies

Data: Simulations showed that energy could be saved by maximizing 1st stage suction pressure while holding 3rd stage suction pressure constant. Since 3rd stage suction was held constant, the only way to change the 1st stage suction was to change the discharge pressure of the machine. Previously, the machine was artificially loaded by increasing discharge pressure to keep the 1st stage suction pressure low (this ensured no problems with a specific tower condenser)

Results: A new application was commissioned to maximize 1st stage suction (to a tower condenser constraint) by minimizing discharge pressure (to a CW temperature constraint) all the while keeping 3rd stage suction constant.

This effort required no maintenance or capital funds and reduced energy consumption roughly 437,000 MMBtu/yr

Case 2: LP Steam Imbalances

Opportunity: Minimize steam letdown and venting

Hurdle: High piping dP at the point of consumption prevented flow from an area of the plant where there was excess steam

Data: Steam injection piping to furnace burners was under-sized and causing the high dP. Existing controls strategies around the LP header and letdown were not state-of-the-art

Results: The burner steam injection piping was replaced at a small cost enabling improved optimization of the plant-wide LP header.

Controls were modified to reduce letdown and venting by optimizing end user pressure set points (deaerators) to sink more steam into recoverable dispositions.

This project had a small fixed cost and yielded 275,000 MMBtu/yr annualized energy savings.

Case 3: CW Pump Optimization

Opportunity: Reduce CW energy consumption by optimizing the number of pumps online

Hurdle: A long-standing belief that specific exchangers would suffer if CW supply pressure was reduced. The presumption was that CW flow to the exchangers would be significantly reduced causing less heat transfer, hotter process side conditions, and accelerated fouling rates

Data: Tests were performed to determine the effects of turning off one CW pump. The exchangers demonstrated no problems related to insufficient CW flow

Results: The plant’s CW demand was met with one less pump than was previously believed possible

This saved approximately 240,000 MMBtu/yr in electrical power

Case 4: Deaerator Steam Management

Opportunity: Reduce steam loss by optimizing deaerator vents

Hurdle: Changes from historical operation

Data: In order to keep the concentration of non-condensibles in the BFW low, the vent rate was fixed at a somewhat high value. A GEMS assessment team believed the vents could be closed a bit more without affecting deaerator performance

Results: The vents were closed substantially, reducing steam losses to the atmosphere with little effect on deaerator performance

This saved approximately 201,000 MMBtu/yr in steam losses

Low / No Cost Summary

Total Project Cost	**$80,000**
Total Energy Savings	**1.153 TBtu/yr**
Total Energy $$$ Savings	**> 6.5 M$/yr**
Total CO_2 Emission Reductions	**66,650 Tons/yr**
Energy Savings per unit of production	**4%**

- **Low / no cost opportunity always exists!**
- **Activities like GEMS Assessments and tools like Key Energy Variables can help identify these opportunities!**
- **Energy savings represent $$$ and environmental benefits!**

Questions?