



Air Products Energy Efficiency Discussion

Wendy Graham
July 16, 2008

tell me  **more**

Air Products Fast Facts



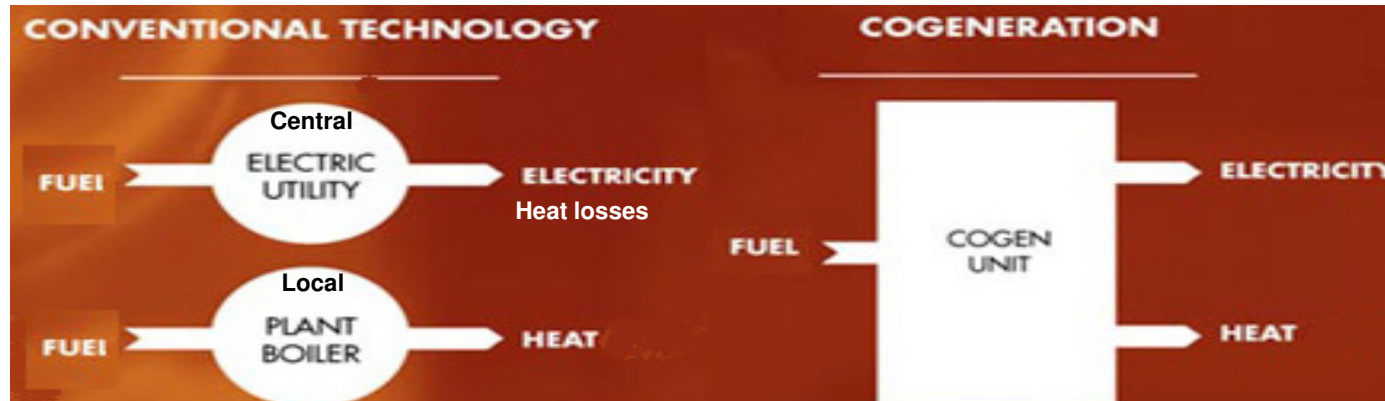
- For fiscal 2007, total consolidated company sales of \$10B
- Global gases, chemicals, equipment and services provider
- Serving technology, energy, healthcare and industrial markets
- Diversified markets with > 50% of sales outside the U.S.
- Fortune 500 company
- One of the safest large-scale chemical companies
- Operations in more than 40 countries
- >20,000 employees worldwide
- Known for our innovative culture and operational excellence
- Corporate responsibility commitment

Our Proud Heritage



- Revolutionary on-site gas supply concept established 1940
 - Producing and selling industrial gases by building gas-generating facilities adjacent to larger-volume gas users
- Concept reduces costs and footprint
 - Distribution costs
 - Energy consumption
 - Emissions
- Efficiency is a business fundamental

Cogeneration Onsite



- Cogeneration significantly increases system efficiency
- Key barriers to distributing excess power to market
 - Transmission services at reasonable rates to allow cogenerators access to open markets
 - Guidelines for the purchase of backup service at rates that reflect their actual costs
- Taking cogeneration to the next level
 - Integrated hydrogen and cogeneration onsite facilities



Port Arthur II Integrated Hydrogen/Cogeneration Facility, Port Arthur, Texas

Owner/operator: Air Products

Refinery partner: Valero Energy Corp.

The rationale for a typical cogeneration plant is clear: Supply some power, and maybe some steam, to an industrial host and save energy dollars on both sides of the fence. But integrating a cogen plant that also produces hydrogen with a major refinery that operates 24/7 is a job best left to a company with diverse and proven technology skills. The Air Products Port Arthur II project proves that such a job can be done right. Accordingly, it is one of *POWER's* natural gas-fired Top Plants of 2007.

Continual Focus on Process Efficiencies



- Minimize GHG emissions by maximizing our efficiency
- Internal energy efficiency targets set annually
 - Rigorous CI process
- Dedicated efficiency engineers who constantly monitor the performance of our major energy intensive operations
- Use several key measures that pertain to energy efficiency
 - For Example, Specific Power
 - KW-hours of electricity per standard cubic foot of gas produced.
 - Over the last two decades, we have seen our energy use per unit of O₂/N₂ product decrease by over 35%
- Emphasis on step change efforts
 - Ion Transport Membrane (ITM) Oxygen technology
 - Great potential to lower the cost of oxygen, especially for energy-intensive applications such as gasification and combustion

Supply Chain Partnering



■ Partnering with Energy Suppliers

– Demand Loading

- Uses state-of-the-art technology to match our energy needs to the other demands on the energy supplier
 - Shut down our production at times of peak demand
 - Load up production at other times
 - Optimizes the generation efficiency

■ Partnering with Customers

– Advanced Inventory Management

- A long history based on telemetry
- Real-time monitoring
 - Increases volume per delivery
 - Minimizes number of trips

■ Perform efficient logistics planning

- Scheduling software maximizes the amount of product hauled and determines the optimum delivery route

To Improve Combustion, Put us in the Mix

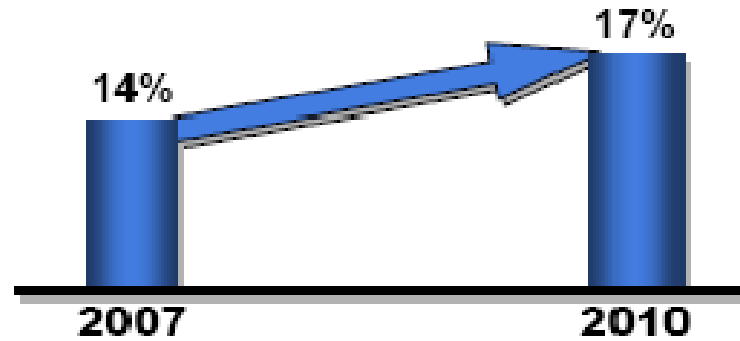
- Improving the efficiency of combustion systems
 - High efficiency oxy-fuel burner systems for the manufacture of glass, steel, cement, etc.
 - Improves Efficiency
 - Reduces Emissions
 - Increases Productivity
 - Extends Furnace Life
 - Improves Quality
- Over 40 years of Oxyfuel experience
- Efficiency Efforts Lead to New Markets
 - Suite of Capture & Purification Technologies
 - Oxyfuel technology for coal fired power plants to enable cost effective CO₂ capture and purification
 - Suitable for retrofit and new-build
 - Development work is needed to demonstrate certain systems, that only involves integration of proven technologies
 - Our focus is on further optimization, integration and cost reduction leading to larger scale demos



Summary APD Key Learnings

- Efficiency is a core value
- Improvements are everywhere even for a world-class efficient company
 - Energy efficiency, Cost savings, GHG emission reductions
 - Incremental improvement are BAU
 - Even minor efficiency efforts can be financially sound and generate GHG reductions
 - Look outside the box for step change efficiency efforts
 - New methods of doing business
 - Check for embedded assumptions
 - New offerings
- Place production where efficiency is optimized

Efficiency Pays



300 basis point operating margin improvement from ...



Thank you.

tell me  **more**