Jeff Haught is a Facilities Engineering Advisor for Anadarko Petroleum Corporation, in The Woodlands, Texas. He currently is responsible for midstream gas plants and gathering systems as well as oversight of the company’s large rotating equipment in various locations around the world. He began his career as a machinery engineer at the Arco refinery in Los Angeles, then moved to Prudhoe Bay; first with Arco and then with Conoco. After assignments with Conoco in S.E. Asia, the Gulf of Mexico, and Russia, Mr. Haught joined Anadarko in 1996 for major project work in Algeria. Since then, he has held positions in engineering and maintenance throughout the company.

Mr. Haught received his B.S. degree (Mechanical Engineering, 1979) from the University of California, Santa Barbara. He is a member of both ASME and PMI. He is a registered Professional Engineer in the States of Texas and California.

The following is a copy of the author’s PowerPoint submittal. It has received no editing.

Aeroderivative, Industrial, and Light Industrial Gas Turbines
A Comparison

The purpose of this Tutorial is to compare Industrial, aeroderivative, and light industrial gas turbine characteristics and their applications. It will also provide some example economic comparisons for different applications and constraints.

Aeroderivative Engines

- Better response to load changes (less GG mass)
- Condition maintenance may be easier due to more inspection ports.
- Higher firing temperatures
- Higher efficiency, better fuel consumption
- Higher NOX and CO
Industrial Engines

- Robust design
- Cast main casings
- Common lube oil system
- Mineral oil suitable
- Hydrodynamic bearings
- Lower firing temperatures

“Lightweight” Industrial

- Fabricated Main Casings
- Hydrodynamic bearings
- Mineral lube oil
- Common lube oil system

Application Considerations

- Original capital cost
- Sparing philosophy
- Maintenance turn-around time
- Maintenance access
- Field service availability
- Cost of fuel gas
- Weight of package
- Emissions requirements

Typical Package Layout

Heavy Duty

- Single or double shaft
- Moderate Compression Ratio
- Moderate Firing Temperature
- "New generation GTs approaching Aero"
- 30MW GT Typical Efficiency
- 26% for Recent Models
- Simpler, Heavier, Cheaper
- Less Maintenance

Aeroderivative

- Gas Generator and Power Turbine in Separate Modules
- Always double shaft (or more)
- High Compression Ratio
- Higher Firing Temperature
- 30MW GT Typical Efficiency
- "High Tech, Lighter, Expensive"
- Higher Maintenance
Application Considerations

An auxiliary Section contains the main unit auxiliaries:
- Lubrication System
- Starting System (Expansion Turbine / Diesel Engine / Electric Motor)
- Hydraulic System

Case Studies

- Capital Cost
- Installed cost
- Fuel cost
- Heat rate
- CO and NOx penalties or credits
- Off design performance (if required)
- Design points/alternate operating conditions
- Replacement/repair costs

<table>
<thead>
<tr>
<th>Application Considerations</th>
<th>Case Studies</th>
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<td>Slide 15.</td>
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### Case Studies

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**NPV (TOTAL):** -455,107,564

**NPV:** -455,107,564

**NPV (TOTAL):** -455,107,564

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Slide 21.

Slide 22.