Siemens Oil and Gas

Answers for Enhanced Oil Recovery
July 11th-12th, 2012
On-Site Solutions
A Paradigm Shift in CO₂ Facilities for EOR
CES Technology
Oxy-Fuel Combustion CO₂, Power, and Water Production

CES OFT-900 Video
• Hundreds of individual platelets are photo-etched to form 3-D channels
• Precisely stacked they get pressure bonded into monolithic injector plate
• Intricate pathways channel bulk fuel, oxygen, and water into hundreds of combustors
• Intimate, stoichiometric mixing for complete combustion
• Oxy-Fuel Combustion
  • Gaseous hydrocarbon fuels
    • Natural gas, associated gas, recycle CO₂
    • High CO₂ content natural gas
    • Intimate mixing of fuel and oxygen to provide clean and complete combustion
  • Producing only steam and high-purity CO₂
• CES 12” GG
• 200MW_{th} capacity
• 15-25 MMscfd of CO$_2$ from natural gas
• Up to 500,000 lbs per hour of drive gas

• Unparalleled fuel flexibility
• Full power in seconds
• Combustor: 6ft in length/12” dia.
• Packaged in 40’x11’x11’ container

**CES Technology**
Oxy-Fuel Combustion Gas Generator
CES Technology
Platelet Injector Re-Heat Combustors
On-Site Solutions for EOR

CES Power Cycles for Zero Emission Power, Water, and CO$_2$

- Natural Gas/Contaminated Gas/Associated Gas
- Air
- Power Output
- OF-Turbine Retrofit Program
- CO$_2$ to EOR
- CW
- Excess Water

ON-SITE EOR SOLUTIONS
Answers for Enhanced Oil Recovery

Oxy-Fuel Turbine Development
Answers for Enhanced Oil Recovery
Siemens SGT900 conversion to Oxy-fuel Turbine

Compressor removed

Oxy-fuel Reheaters

Power Turbine

Plenum – hot gas intake
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Siemens SGT900 conversion to Oxy-fuel Turbine
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Siemens SGT900 conversion to Oxy-fuel Turbine

FWD
Upper Half
casting

FWD
Lower Half
Machined
Answers for Enhanced Oil Recovery
Siemens SGT900 conversion to Oxy-fuel Turbine
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How is this technology integrated?
Answers for Enhanced Oil Recovery

Typical Oxy-Fuel EOR Technology

- Natural Gas/Contaminated Gas/Associated Gas
- Air

ASU → RH

GG → HP

OFT

CO₂ to EOR

Condenser

Power Output

CW

Excess Water

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Answers for Enhanced Oil Recovery
Oxy-Fuel EOR Plant – Opportunity Overview

Fuels
- Natural Gas
- Stranded Gas
- Micronized Petcoke
- Biomass
- Syngas

Products
- Power
- Water (steam)
- CO₂
- N₂

Applications
- CO₂ EOR
- SAGD
- CSS
- Stranded Gas
October 1st, 2010

“Maersk Oil Acquires CES Zero Emission Technology Rights”
January 25th, 2011

“Maersk Oil and Siemens Join Forces for Clean Power Generation”
December 8th, 2011
Answers for Enhanced Oil Recovery
Oxy-Fuel EOR Plant
We are happy to work with you and answer your questions!
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