Modular GTL – Technology Overview
Enercon: 25th and 26th June 2012
Moscow
Mike Bowe - Chief Technologist
Development of the CompactGTL Process

Lab Scale Development
- 12 Years rig operations & modelling
- Reactor & catalyst development
- Independent verification

2000 -

UK Pilot Plant
- 4 Years operations
- Reactor & catalyst manufacturer selection
- Now an Operator training centre

2008 -

Brazil Commercial Demonstration Plant
- 18 Months operations
- Process approval Dec 2011

2010 -

Client Funded Project Studies
- GAZPROM Onshore Russia
- Other IOC’s under NDA
- Plants @ 200bpd to 5,000bpd

- 12 Years rig operations & modelling
- Reactor & catalyst development
- Independent verification

Slide 1 © 2012 CompactGTL plc
Process Overview

- **gas treatment**
  - pre-wash
  - NGL recovery
  - mercury removal
  - heating
  - sulphur removal

- **Syngas production**
  - SMR 1 reactor modules
  - SMR 2 reactor modules
  - steam generation (WHB)
  - Syngas cleaning + compressor

- **FT synthesis**
  - FT cooling System
  - FT 1 reactor modules
  - FT 2 reactor modules

**No Oxygen Required!**

- High CO₂ Possible!

- HC rich tail-gas
  - GT drivers or steam turbine

- H₂ rich tail-gas

- Syncrude

Slide 2 © 2012 CompactGTL plc
Why is this now possible?

Conventional Tubular steam Reformer / ATR

Conventional FT reactor e.g. slurry phase

10x increase in specific throughput

CompactGTL reactors using brazed plate & fin construction

Compact SMR Reactor

Compact FT Reactor
High heat transfer from 
Combustion stream into 
SMR process stream
Process intensified mini-channel FT

Compact FT Reactor

FT Stream
Coolant Stream

High heat transfer from FT process stream into coolant stream

FT catalyst foil inserts
Mini-channel CompactGTL reactors

- Automated catalyst insertion & removal
- Brazed Plate-Fin reactor construction minimises metal content / weight
- Corrugated metallic catalyst inserts maximise active surface area per channel
SMR Reactor Core Construction
FT Reactor Core Construction
Reactor & Process Technology Development Workflow

Lab Reactors

UK Pilot Plant

Brazil CDP

Commercial Plant

Multiple Reactor & Catalyst Suppliers

Lab Reactor Tests < 10 Channels

Prototype Reactor Tests 50-100 Channels

Brazil CDP Option Selection

Commercial Plant Design

Reaction Kinetics

CFD Modelling

Process Modelling

Heat & Mass Balances

Slide 9 © 2012 CompactGTL plc
Model based reactor design & scale up methodology

- Catalyst screening
- Reaction modelling
- Reactor modelling
- Model validation
- Reactor design & scale up

Lab reactors for all process steps

Fitting of reaction parameters

Computed fluid dynamics

Experimental validation of model predictions

Lab reactors for all process steps

Reactor models with detailed kinetics

Process heat and mass balances

Slide 10 © 2012 CompactGTL plc
Modular Plant – Critical for Oilfield Projects

- Inherent Reliability
- Scaleability
- Operability
- High Turn Down
- Access to Site
- Reactor Changeout

The number of active reactor modules can be adjusted to match the associated gas production profile over time.
UK Pilot plant achievements

Installation at Wilton, NE England

Plant commissioned July 2008

- Confirming catalyst & reactor performance from manufacturers
- Integrated operation – ‘gas in to liquids out’
- Operational stability, start-up & shut down procedures
- Variable feed gas composition & CO₂ content
- Operator training for larger plants
Inside the UK pilot plant

**SMR process equipment**

**FT process equipment**
World’s first modular fully integrated GTL facility!

Plant commissioned in December 2010. CompactGTL technology now approved by Petrobras for deployment.

- Gas pre-treatment
- Pre-reforming
- Reforming
- Waste heat recovery
- Process steam generation
- Syngas compression and cleaning
- Fischer Tropsch synthesis
- FT cooling water system
- Tail gas recycling

Image shown courtesy of Petrobras
CDP reactors at Sumitomo in Osaka, Japan

Completed brazed pilot reactor block

Building block for commercial reactor modules
Reactor transport arrives in Osaka!
250MMscm/year GTL Integrated FPSO – SBM Offshore

- **Fully Integrated Design**
- **Up to 50,000 bbl/d Crude Production**
- **2,000 bbl/d GTL Liquids Production**
Commercial Plants @ 20 – 500MMscm/year

- Standardised mass produced SMR & FT modules
- Road / rail transportable reactor modules
- Bespoke balance of plant to suit client project

Blend Syncrude with the Crude Oil Export
Safe, operable & industry approved technology

Access & develop remote oilfields onshore & offshore

Increase NPV of oilfield developments
Modular GTL – Technology Overview

Enercon: 25th and 26th June 2012

Moscow

Mike Bowe - Chief Technologist