Small Scale GTL - Upstream Sector Leads the Way

Gulf Publishing GTL Technology Forum
Houston TX
30-31 July 2014
Iain Baxter – Chief Operating Officer
In the news today.....

Wall Street Journal
Former BP Boss Tony Hayward Enjoys the Small Time
By SELINA WILLIAMS
30 July 2014

“In the oil industry, small is rarely beautiful”
Gas volume, distance to market and infrastructure constraints are the key factors dictating gas solution selection.

1. Gas Access

**Reinjection & Flaring**
- Smaller volumes at remote locations, generating no value

**Gas Pipeline**
- Moderate to large volumes at moderate distance to a gas market

**Gas to Wire**
- Smaller volumes with nearby market for electricity

**CNG (Compressed Natural Gas)**
- Moderate volumes at moderate distance to gas market

**LNG (Liquefied Natural Gas)**
- Large volumes at remote locations
Monetisation options don’t compete with small scale GTL
“Stranded oil” – vast opportunity

73Bn bbls

Source: Wood Mackenzie & Fugro Roberston
Stranded gas – vast opportunity

>500 TCF

Source: EIA & BP Statistical Report (Numbers shown on map are total reserves, not stranded gas)
The real issues....

• Realisable gas cost
• Flow rate continuity
• Gas ownership & trading restrictions
• Dry gas following NGL recovery
Not just the oil price.....

- Realisable net back value
- Certification for fuels
- Export infrastructure
- Fiscal regime / taxes

2. Product Offtake
Just some of the technical aspects...

3. Technology

- Demonstrable, integrated process
- Modular, not “modularised”
- Catalyst life & replacement
- Plant availability
A working solution is not just an “FT Island”

Operational impacts must be fully understood for whole plant:

- FT tail gas recycle
- “In sympathy” trips
- Utility variability & failure
- Feed gas variability

10,000 bpd Plant
Modular, not “modularised”

- CompactGTL technology is inherently modular.
- CompactGTL reactors are simple steel plate/fin heat exchangers.
- Modular technology is flexible, mass produceable & deployable in remote sites.
- But “modularising” conventional reactor vessels & equipment just adds cost!
Long FT catalyst life is essential

**Single Stage Fixed**

Conventional & Modular

- Short catalyst life, frequent re-generation
- Low availability, high opex
- Unsuitable for remote site deployment
- Duty + standby reactors just adds cost

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Catalyst continuously “replaced”

- High availability
- Large, tall reactors
- Unsuitable for remote site deployment

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**Two Stage Fixed**

- 3-5 year catalyst life, no re-generation
- High availability, low opex
- Modular reactors
- Perfect for remote site deployment
FT Catalyst replacement in-Situ would shut the whole plant down!

• CompactGTL reactor modules exchanged in pairs for spares
• Plant continues to operate
• No catalyst handling and safety issues on the operational site
• = High availability = low opex
1\textsuperscript{st} Project is key

- Economic “Headroom” for financing costs
- Competition for capital
- Early projects - entrepreneurial
- Bankable technology for 2\textsuperscript{nd} project
- So 1\textsuperscript{st} project is the key
2014 – Developments to date for CompactGTL

- US$ 40 million reactor factory completion by Sumitomo
- MOC with Kazakh government
- US$ 300 million plant announced in Kazakhstan
- US$ 50 million new investment in company
Kazakhstan

The size of Europe with a population of only 17 million

- Numerous remote fields
- Gas far from infrastructure & population centres
- Gas utilisation improvement is a government priority
CompactGTL plant design for Kazakhstan project

Fully integrated plant – remote location

Turnkey project by CompactGTL

Engineering support partner – Fluor

Operational by the end of 2017
A major milestone...

7th March 2014: MOC between Kazakhstan Oil Ministry & CompactGTL
How did we do it?
Development pathway

3rd Party conceptual engineering

Lab

Pilot

Demo

Commercial

3rd Party technology verification
Competitive supplier selection

SMR Catalysts
Combustion Catalysts
FT Catalysts

SMR Reactors
FT Reactors

3 x Manufacturers

Catalyst Partner

4 x Manufacturers

Reactor Partner
World class supply chain

- Kawasaki
- Reactor suppliers
- Reactor modularisation
- Catalyst suppliers
- Engineering & project delivery partner
- Consultants
- FPSO Project delivery & expertise
- Johnson Matthey
- FLUOR

Compact GTL
The modular gas solution

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Fully integrated plant demonstration with Petrobras

- Commercial CompactGTL FT Reactors
- Constructed by Sumitomo
- Comprise multiple reactor blocks proven in Brazil
- Containerised into 40’ (12m) modules by KHI

Photo courtesy of Petrobras
CompactGTL provides a complete Turn-Key solution

Planning & FEED
- Economic Appraisal
- Design Concept Selection
- FEED
- Local Permitting
- EPC Contractor Qualification
- Supported by Fluor

Execution
- EPC Contractor Tendering
- High Local Content
- Detailed Engineering
- Procurement
- Construction
- Commissioning
- Fluor Supervisory Support

Operations & Maintenance
- CGTL Turnkey Plant Operations
- Or: Operator Training – UK & Local
- CGTL Reactor Maintenance - Local Facilities
- Local Employment & Investment
Takeaways

- 73Bn bbls stranded oil plus 500 TCF stranded gas are out there!
- Upstream sector leads – remote gas at zero or negative value
- Remote projects need 2-Stage FT technology
- High returns needed due to competition for capital
- 1st project opens the flood gates:

CompactGTL in 2014:
- US$40 million reactor factory by SPP MOC with Kazakh government
- US$300 million Kazakhstan project
- US$50 million new investment
Thank you