Successful Start-up of First Haldor Topsoe TiGAS™ Plant in Turkmenistan

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Outline

• The history of TiGAS™
• The process
• The catalysts
• The products
• The Turkmenistan project
• The future
The history of TiGAS™ - an old new technology

- 1969, ZSM-5 catalyst developed by Mobil
- 1980 -1986 Pilot demos in Denmark & Houston
- 2010 First GSK-10 test production
- 2010-14 DOE project, green gasoline demo
- 2011 First catalyst sale to Qinghua 100 kt/y plant
- 2014 TIGAS pilot in operation in Denmark
- 2014 First TIGAS catalyst & technology sale (15,500 bpd)
- 2019 Commissioning & startup of GTG-1, Turkmenistan
The Process - TiGAS™

TIGAS: Topsoe Improved GASoline Synthesis

1. **Reforming**
2. **Methanol synthesis**
3. **Gasoline synthesis**
4. **Fractionation**
   - Gasoline Upgrade
   - LPG
   - Gasoline

Feed gas
NG

Steam
Syncor (ATR) & Methanol Synthesis

1. Natural gas → Hydrogen generator
2. Natural gas → Sulfur removal
3. Natural gas → Pre-reformer
4. Oxygen/steam → Autothermal reformer
5. Steam → Methanol reactor
6. Steam → Hydrogen recovery
7. Hydrogen recovery → Raw methanol
Gasoline Synthesis
Gasoline catalyst: Cyclic operation

- Active Catalyst
- Coking (low MeOH slip)
- Increasing MeOH slip
- Regeneration (burn off coke)
Fractionation & Upgrade

Diagram showing the process of fractionation and upgrade with arrows indicating the flow of raw gasoline, stabilized gasoline, and other products through various units like De-ethanizer, LPG splitter, Gasoline splitter, Isomerisation, and GIK-10.
The Catalysts

- All catalysts produced and supplied by Topsøe
The products

- >5200 MTPD Methanol – largest methanol plant with ATR
- 15,500 bpd gasoline which is used directly at the gas stations
- RON>92
- No Sulfur
- Olefins less than 18 vol%
- Aromatics less than 35%
- Benzene less than 1%
- LPG product
The project in Turkmenistan – GTG-1

Turkmengaz – owner
Kawasaki – EPC
Rönesans – Construction, off sites
Haldor Topsøe – License, engineering, catalyst, prop HW
GTG-1, Project milestones

- Contract signed August 2014
- Basic engineering started August 2014
- First mobilization at site March 2015
- First concrete poured August 2015
- Construction completed December 2018
- Commissioning started January 2019
- First production of gasoline 3 May 2019, 3.15 pm
The future

- TiGAS™ is applicable when there is:
  - 1) an abundance of low cost natural gas
  - 2) a local market for gasoline
  - 3) willingness to invest

- Topsøe is looking at options for green gasoline using TiGAS™ GTG-2 in Turkmenistan in 2020?
Thank you for listening
Questions?