GLOBAL RE-ENERGY™
Recycling and Renewable Energy Solutions
Building a Greener Future Together

Natural Gas to Liquid/Diesel - Modular Technology

Flares, Stranded or Pipeline Natural Gas

Example of GTL/D Modular Unit

Technology Summary Overview

Natural Gas-To-Liquid/Diesel refineries more commonly referred in diminutive, as GTDs, these plants are intended to be hookup directly into the natural gas source. The GTDs will produce ultra low sulfur Diesel (ULSD) obtained from the raw natural gas from wells or from waste gases (flares) discarded from the petrochemical industry. These diesel-producing plants can be replicated on different locations as needed to produce the desire amount of clean Diesel fuel. The end product, ULS-Diesel, can be marketed nationally or sold to international markets.

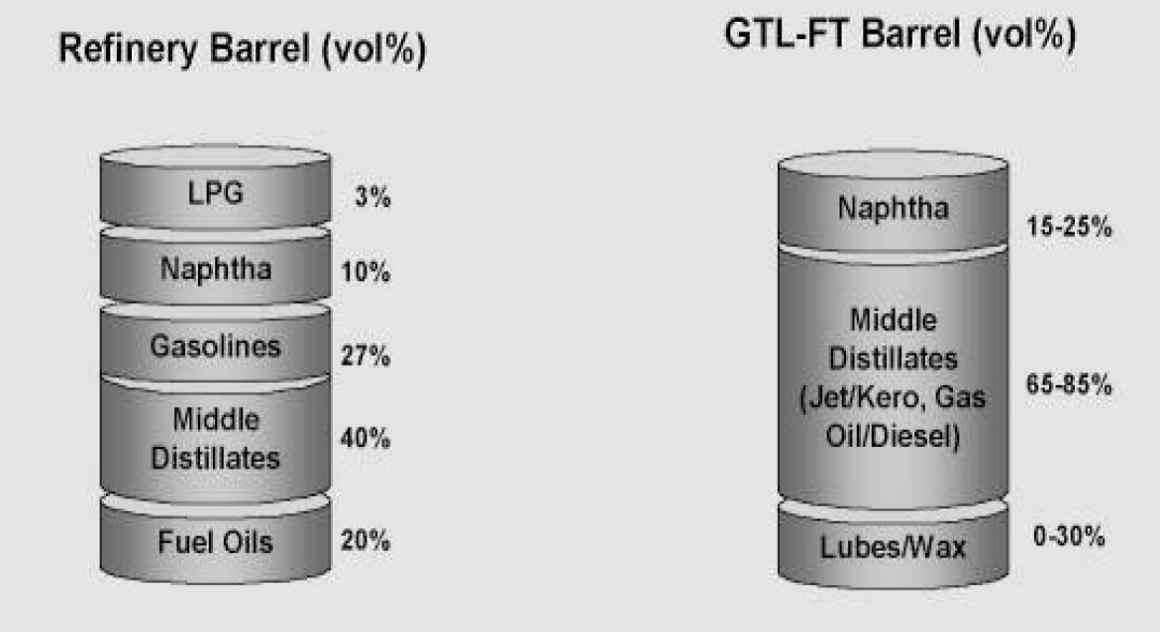
The GTD production capacity of 200 barrels (8,400 gal.) of diesel per day has been selected for our projects since it is the most profitable size of the modular movable units, the amounts of units to be installed will depend on a given projects scope and the amount of natural gas available.

GTL/D Project Scope

Stranded natural gas fields have to concentrate their efforts in monetizing natural gas resources and Gas-To-Liquid (GTL) fuel technology represents one of several major alternatives for natural gas producers to monetize their gas.

While Pipeline and Liquefied natural gas (LNG) options focus on the natural gas markets, GTL provides the only option for natural gas producing entities to diversify into the more lucrative transportation fuel markets as the process yields various liquid products like diesel and jet fuel (subject to operators market discretion for maximum monetization potential by demand for re-sale). This puts the GTL products in competition with highly refined crude oil products.

GTL plants can be modified to achieve different product mixes. However, most GTL projects under development are targeting the production of middle distillates (particularly diesel) as well as some naphtha and liquefied petroleum gas (LPG). Figures below compare a barrel from a conventional refinery to a barrel of products of a GTL. This illustrates the significant difference between the product mix of a GTL plant and that of a conventional refinery.



The advantage of the GTL option is that its products compete advantageously with petroleum products. The higher quality of GTL's product mix over conventionally refined petroleum products virtually ensures it earns a premium in international markets whose demand for cleaner fuels has increase steadily.

Normal diesel and clear GTD ULS diesel

Project Objective

Global Re-Energy's project objective is intended to furnish the knowledge to evaluate the installation of one or several natural Gas-To-Diesel (GTD) refineries throughout the available stranded natural gas fields in order to convert small volumes of its natural gas into the highest quality diesel, which is Ultra Low Sulfur (5ppm or less). These processing GTD plants are autonomous and can be installed anywhere that the gas is produced even on off shore platforms, active Oil Wells producing gas that is lost via flame burn at stand alone wells or stranded gas fields, allowing to profitably participate in the company's priority of increasing the monetization of available natural gas reserve.

Technology Overview

Basics of the Technology

Gas-To-Diesel involves the chemical conversion of natural gas or other hydrocarbons into diesel. The proven Gas-To-Liquid production method is Fischer-Tropsch or FT process, developed in the 1920s by two German scientists, Franz Fischer and Hans Tropsch. The FT process is a chemical reaction that utilizes catalysts to "synthesize complex hydrocarbons from simpler organic chemicals".

Brief description of the process

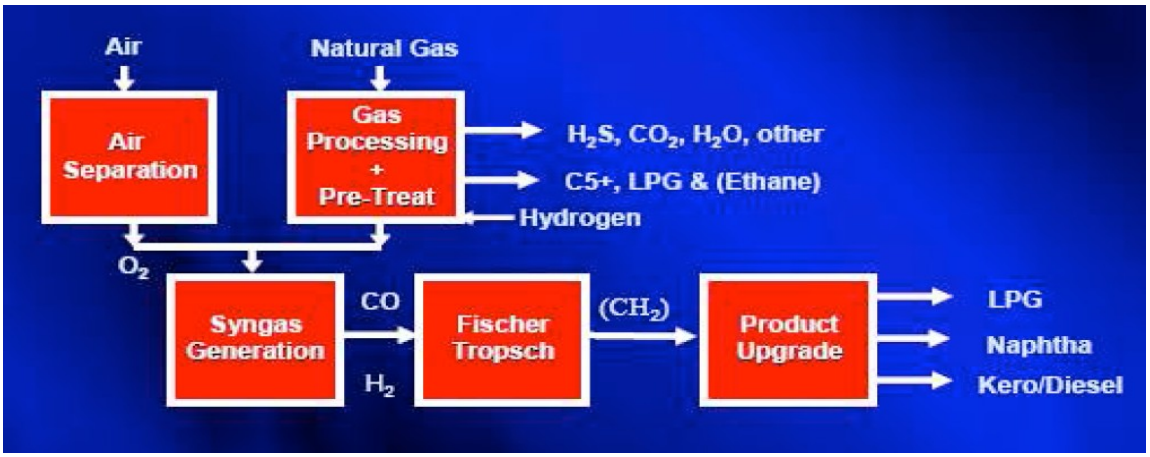
The current application of modern natural gas-based Fischer-Tropsch process technology can be categorized into two procedures:

1. The High Temperature Fischer-Tropsch (HTFT) process technology – HTFT uses iron as a catalyst within a temperature range of 300-350°C. The products from the process include petrol (gasoline) and gas oil and have almost zero sulfur but contain aromatics.

2. The Low Temperature Fischer-Tropsch (LTFT) process technology – LTFT uses cobalt as a catalyst within a temperature range of 200-240°C The process produces GTL Fuel, a very clean synthetic fraction of gas oil that is virtually free of sulfur and aromatics.

There are various large commercial applications of the FT process that have been executed by such companies as Sasol, Shell, Syntroleum, among others. The differences in the application of the technology relate to the design of the reactor and catalyst technology. Virtually all of them, however, include the following key steps:

1. Natural gas separation and treatment to remove water and impurities;
2. Production of synthesis gas (syngas);
3. Fischer-Tropsch conversion to produce hydrocarbon waxes; and
4. Final refinery upgrade to produce finished products.



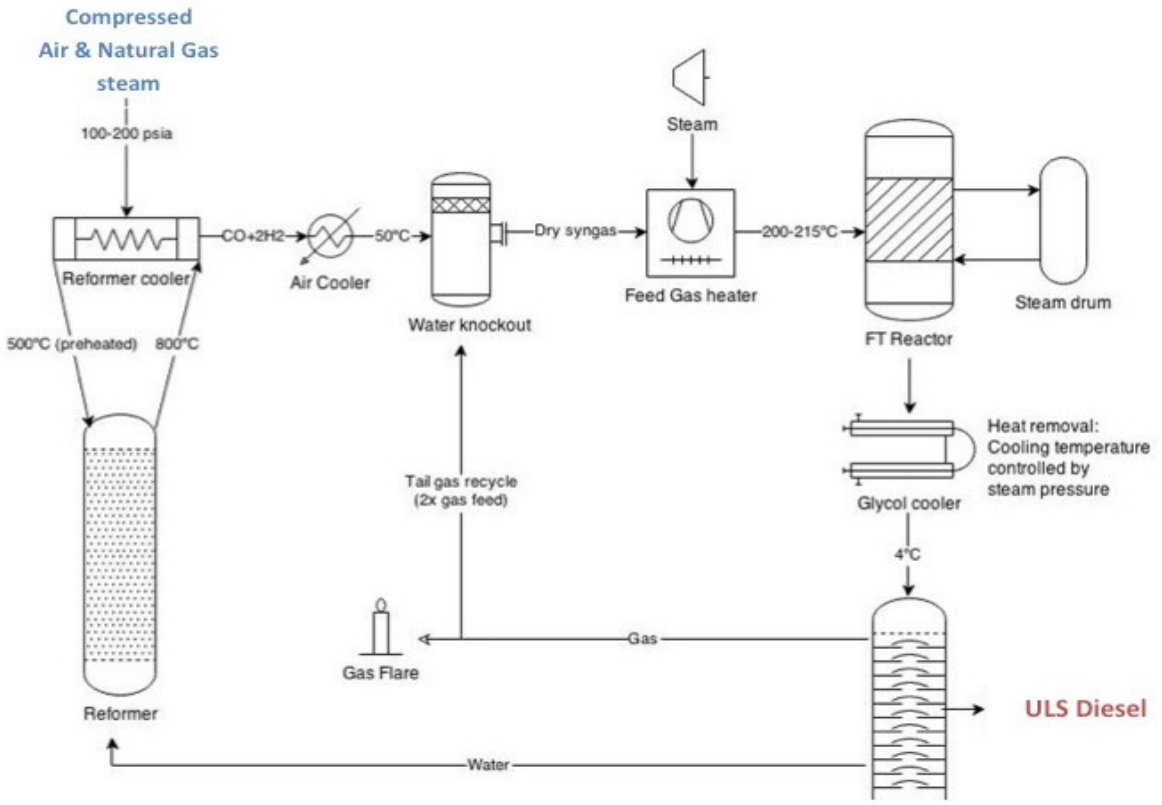
FT Technology to be used

For the purpose of our project development we are referring to the low temperature FT process with up to date syngas reforming solutions for enhanced diesel production. New advancements uses only air for catalytic partial oxidation reformer and unique proprietary wax-free catalyst on advance Fischer-Tropsch reactor, these new conditions have simplified the process significantly and reduce capital expenditures and operating cost that opened a new era of small scale GTL/GTD conversion units that delivers excellent economics.

The new Fischer-Tropsch based Gas to Liquids (GTL) process key differentiation is:

- Patented catalyst, the patented GTD technology captures and converts 100% of natural gas into ultra clean diesel, producing 0% emissions.
- Only product converting gas directly to ultra-clean diesel in single pass, at low-pressure, no hydro-cracking
- Significant savings in capital & operational cost
- By-products: water, surplus electricity. Units are self-powering (excellent for remote, desert or arctic use)
- Process reviewed & endorsed by the World Bank Global Gas-Flaring Reduction Partnership

ACTUAL GTD PROCESS SCHEMATIC



STEP 1 – INPUT GAS SCRUBBING

- Higher combustibles (ethane, propane, etc.) improve diesel production
- Inerts have no effect
- H2S degrades catalyst performance and must be removed, to a level >1 PPM
- This requires a standard gas scrubber (SulfaTreat or zinc oxide possible)
- OR: a proprietary Batch Oxidation technology to convert H2S to elemental sulfur

STEP 2 – GTD UNIT STARTUP

- A small amount of hydrocarbon raw gas is burned in the reformer
- This is used to pre-heat the entire train.
- As delivered, the Fischer-Tropsch catalyst contains cobalt oxide (the metallic form is pyrophoric when exposed to air and would be dangerous to handle).
- To activate the catalyst for FT syngas conversion: catalyst reduced to metallic cobalt inside FT reactor using hydrogen

STEP 3 – SYNGAS PRODUCTION

- Feed gas moves into a highly-advanced plasma-based Syngas Reformer
- Required temperature and pressure (50PSI) is achieved
- Gas fully prepared for conversion in next stage: H2:CO ratio sought 2.0
- (Includes compressor, coolers, water knockout, piping to storage)

STEP 4 – ULS-DIESEL PRODUCTION

- High capacity Fischer-Tropsch reactor comprised of 4 inch catalyst tubes
- Pressure <200PSI, cobalt catalyst crystallite size 16NM
- Syngas converted into diesel, water, naphtha, tail gasses
- (Includes FT reactor, coolant condenser, coolant circulation equipment, synthesis gas recycle loop)

STEP 5 – ULS-DIESEL COLLECTION

- FT Reactor products are separated and captured in one 'cold trap' and one 'hot trap'
- They are then directed to different storage tanks on site, waiting tanker trucks, or possibly pipelines, for further distribution to end-users
- The process continues once started.
- The GTD refinery runs 24 hours a day 7 days a week for 350 days a year.

ULSD FUEL SPECS

The diesel produced with the patented catalyst has special characteristics which makes the Ultra low Sulfur Diesel produced a particularly high-value product.

- First, our process is unique in that it produces vehicle ready diesel directly from the conversion unit. Unlike other GTL, our product does NOT have high wax content. Therefore, there is no need for further, expensive, refining through hydrocracking.
- Second, our diesel has a very high Cetane number (78, versus a normal specification of 43). This allows for cleaner, higher-yield combustion.
- Third, the process produces 94% hydrocarbons versus an industry standard 45-50%.
- Fourth, because of the nature of our unit's chemical reaction, the diesel has Zero sulfur and Zero aromatics content, making it the cleanest burning diesel available.

Because of these unique characteristics of the diesel obtain, our projects enable the operator to either use or sell the diesel as it is, or, they can use it as blending stock. This means that by mixing our Zero sulfur and Zero aromatics diesel with conventional diesel, they can "dilute" their way to complying with whatever regulations are in force concerning allowable levels of sulfur and aromatics content on the fuel in order to meet any country or jurisdiction. This would be significantly more cost effective than achieving the same effect through further conventional refining.

Critical design issues, constraints, limitations

It is important to note that our current project scope is for small petrochemical GTD plants designed specifically for the location parameters and for the quality and amount of the natural gas that will feed the GTD refinery. These GTD plants are modular in design to allow fast installation and upgrades. Plants are automated and produce the needed electricity and water that are both generated on the process of transforming the natural gas thus only needing initial energy and water for startup.

We have limited the project scope to an output of 200 BPD of synthetic Diesel based on its efficiency and flexibility, although GTDs with larger or smaller production capacities can be made, these mobile units can be used for flare recovery in inland wells or offshore rigs that turn to be very profitable. Larger outputs will decrease Capital Expenditures [CAPEX] and Operational Expenditures [OPEX] per barrel somewhat but limit the flexibility in location selection and assurances of long-term natural gas volume supply and feedstock reliability.

Production Capacity

The intention of a GTD project is to install one or several natural Gas to Diesel refinery plant with a capacity of 200 barrels per day (bpd) of ultra low sulfur diesel. On this size economies of scale do not play an important role and although relatively very small they are as efficient as the existing counterpart big scale installation in existence today. If the GTD project merits increase of the diesel production, it will simply mean replicating the investments on additional identical plants.

Personnel Needed

GTDs are a small size petrochemical plant, were the process is mostly automated and can be monitored remotely. To run its 24/7 operation it needs a team composed by at least 2 engineering technicians plus office, logistic, maintenance and security, the required three shifts will normally amount to less than 10 full time jobs that can manage several units.

Natural Gas Volume Needed

To produce each barrel (42 gallons) of diesel you need an estimated 10,000 cubic foot of natural gas equivalent to 0.01 MMcf. As an example a GTD refinery with a capacity of 200 barrel per day of diesel will need an estimated daily feed of 2 million cubic foot (2MMcf) of natural gas.

Cost of Natural Gas

This is a relative value and it's subject to the project source of the natural gas feedstock and thus the location of the plant(s). If the GTD development is hookup to associated-gas from flares the cost of natural gas is zero (US$0.00) and if the gas feedstock comes from a stranded gas field the cost of the gas should be equivalent to the cost of extraction of the natural gas, or the established natural gas lessor's royalty rate plus the severance tax of the area, but if the GTD industry is to be connected to the existing natural gas sales pipeline, the opportunity cost of the

natural gas has to be considered and will be relevant to the price established for the pipeline gas.

Cost of Production

Average cost of production per barrel of ULSD is US$8.00. This cost of production includes every direct and indirect cost relevant to the GTD plant and only excludes the financial cost and the cost of the proprietary catalyst and licenses [royalty] mentioned separately.

Cost of Catalyst

Proprietary catalyst rent, maintenance and replacement are rolled into one annual charge of US 100,000.00 for the 200bpd GTD plant.

Catalysts are not consumed in the catalyzed reaction; they can continue to catalyze the reaction of further quantities of reactant. Only tiny amounts are required and they are maintain every 4-month and replace every year if necessary and depends of the quality of the natural gas processed.

Technology Royalty

Use of proprietary catalyst and equipment parts requires payments of royalty that are charge estimated as a 5% subject to capacity of production of the gross sales of ultra low sulfur diesel, thus it fluctuates in accordance with sales.

Products and By-products Obtained

On the GTD process, to produce one barrel (42 gallons) of diesel the following will be obtained:

42.00 gallons of Ultra Low Sulfur Diesel
2.33 gallons of Naphtha
0.45 gallons of Wax
46.20 gallons of potable water

All of the products derived from the GTD process are highly marketable with prices established in local and international markets.

Budget

Cost of Installation

The capital investment for a turnkey GTD plant with production capabilities of up to 200 BPD range varies little by location and quality of gas, which will be determined by pre analysis of each proposed project parameters and scale.

Conclusion:

Up to date Gas to Diesel technology opens a real possibility of monetizing gas resources usually rest to waste or dormant, such as flares gasses from oil wells or petrochemical plants or from inaccessible thus stranded natural gas fields opens vast profit potential for operators.

Global Re-Energy, Inc. as a Project Developer will Design-Build-Commission turnkey modular plants on account of Owner/Operators.. Additionally, Global Re-Energy subject to market dynamics and securing contracts through our Petroleum and Gas Group can Finance-Design-Build and Operate GTD's as an Owner/Operator.

Project Dynamics will determine Global Re-Energy's function within this scope as project developer and or developer/owner – operator.

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