The 2,400 MTPD Methanol Plant at Tjeldbergodden

by

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Summary

This paper describes the design, start up and the initial operation of the 2,400 MTPD methanol plant at Tjeldbergodden, Mid-Norway, owned jointly by Statoil and Conoco and operated by Statoil.

This plant features a combination of new technologies and operating parameters never before demonstrated in a world scale grassroots methanol plant, including a falling film saturator, prereforming, two-step reforming (tubular reforming followed by oxygen-blown secondary reforming) at low steam to carbon ratio, and a three-column distillation. These features help make the plant among the most energy efficient in the world.

The focus of the present paper will be on the implementation and performance of this new technology.

Introduction

The Tjeldbergodden methanol plant is based on associated gas from the Heidrun oil field, which was discovered in 1985 during exploration in the upper part of the North Sea. The discovery was made by a consortium consisting of Statoil, Conoco and two minority partners.

Besides oil, the Heidrun field contains a significant portion of associated gas, which needed to be processed in order to develop the field. For various reasons the gas could no be piped to the existing grid of gas pipes in the southern part of the North Sea, and continuous flaring is prohibited by the Norwegian authorities. Consequently, Statoil had to find alternative ways to utilize the gas, such as power generation, re-injection or methanol production. As the most attractive option it was decided to take the gas ashore to produce methanol. The capacity of the plant was pegged at 2,400 metric tons/day, or 800,000 metric tons/year, thereby making it one of the largest methanol plants in the world.

The Heidrun field is located in the Haltenbanken sector just south of the Arctic Circle, approximately 200 km from the Norwegian coast and approximately 600 km north east of the closest point of the existing North Sea gas pipeline grid. In consideration of this location, it was decided to take the gas ashore at Tjeldbergodden, close to Trondheim, which houses the centre of Statoil's R&D activities.
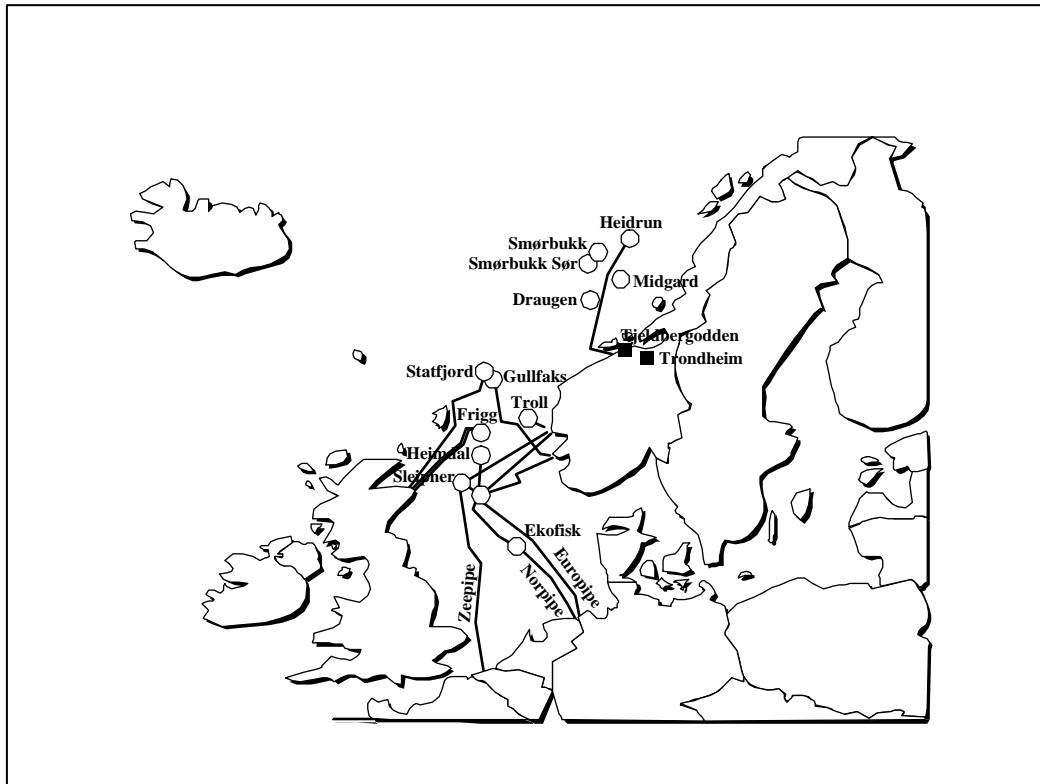
Norwegian Gas Transport Systems

A location at the Norwegian coast close to the Arctic Circle may seem too remote and too exposed for a petrochemical plant, but, due to the Gulf Stream, the coast is ice-free. Furthermore, the harbour at Tjeldbergodden enjoys natural protection by islands, and the Trondheim Fjord is deep, providing ample draught for large ships.

There is no local consumption of methanol in the region, but the cost of shipping the product to Rotterdam is very low compared to the cost from competing plants in Russia, Libya and the Middle East. The time required to sail from Tjeldbergodden to Rotterdam is 48 hours.

Strategy for Technology Selection

In 1990 Statoil and Conoco established a project group to study the available methanol technologies. In this connection a number of companies with methanol expertise were retained to perform various studies. Statoil commissioned Topsøe to make a generic comparison between available technologies.

In addition to this technology evaluation, Topsøe performed a number of sensitivity analyses, illustrating for instance the consequences of transporting gas from the other fields on the Haltenbanken sector in the same pipeline.

The conclusion from the project group was that the most attractive synthesis gas generation was the two-step reforming technology, which proved to have both the lowest investment and the highest energy efficiency. In fact, this was the only process lay-out, which met Statoil's requirement for a maximum CO_2 emission corresponding to an overall energy consumption of no more than 30 GJ per metric ton of product (7.18 Gcal/MT). This level for the energy

consumption was fixed during the study phase, and a key objective in the plant approval from the Norwegian parliament.

For the methanol synthesis, Statoil/Conoco chose the boiling water reactor concept, mostly because DuPont, the owner of Conoco, had favourable operational experience with this reactor concept at an existing methanol plant on the US Gulf Coast, but also because of the high energy efficiency.

Since the pipeline is prepared for transport of gas from the other fields in the Haltenbanken sector, the gas composition may vary. To enhance the flexibility towards such variations, it was decided to install a prereformer upstream of the tubular reformer. Consequently, the Tjeldbergodden methanol plant is based on synthesis gas generation by prereforming followed by two-step reforming, methanol synthesis in boiling water reactors, and purification in a three-column distillation unit. The synthesis gas and distillation sections are designed by Haldor Topsøe A/S, while the methanol synthesis section is designed by Lurgi AG.

In order to select the most suitable methanol synthesis catalyst, Statoil R&D undertook an extensive testing of commercially available catalysts. Based on this screening, Topsøe's MK-101 catalyst was selected, and thus Topsøe supplied all catalysts for the entire plant.

Project Objectives

When the final decision to go ahead with the project, a number of objectives were formulated for the design and performance of the plant. These project objectives were, in order of priority:

- The plant should be designed and constructed to create and maintain a safe working environment and must comply with the safety and work standards of Statoil a/s and the authorities.

- The plant must comply with Statoil environmental policy and have adequate protection to contain spills and minimize discharges.

- The plant investment cost should be minimized by employing the best practices for investment, reductions and procurement, resulting in a competitive plant.

- The plant would be expected to operate reliably to produce up to 2,500 MTPD of methanol and operated 8000 hours per year.

- The plant must produce methanol conforming to the November 1990 issue of US Federal Specification of Methanol, Grade AA with the following additions:

Permanganate fading time	min. 60 minutes
Amine content	max. 60 ppb
Methanol content	99.9 wt%
Water content	max. 0.05 wt%
Iron content	max. 0.1 ppm wt
Alkalinity	max. 30 ppm wt

- The plant should be designed for two years intervals between major maintenance turnarounds with the objective of extending this to three years intervals by employing best maintenance practices.

Process Description

Gas Treatment and Reforming
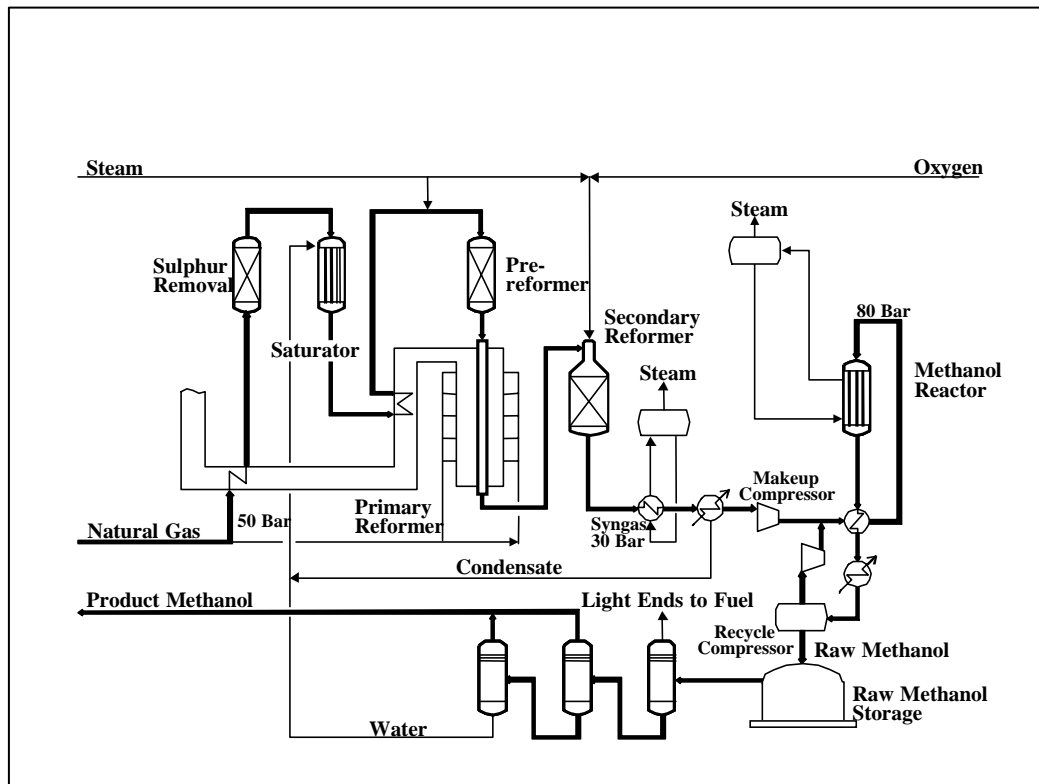
Production Process – Tjeldbergodden

The natural gas enters the plant through a receival terminal, where pressure is reduced from about 150 to 50 bar, any possible slugs of heavy hydrocarbon are removed, and the temperature is adjusted to about 40°C before the gas is admitted to the methanol plant proper.

In the methanol plant the gas is preheated in the waste heat recovery section of the primary reformer, and sulphur (H_2S) is removed at 400°C in a sulphur absorber containing zinc oxide catalyst. After the desulphurization, the natural gas is saturated with process condensate in a saturator, which is heated by the steam from the methanol synthesis reactors. In the synthesis section, steam is produced at about 35 bar, whereas the pressure upstream the reforming section is in excess of 40 bar. This pressure difference is overcomed in the saturator, which is a falling-film type. Process condensate is evaporated without pretreatment on the tube side. The saturated steam from the methanol synthesis reactor is condensed on the shell side of the saturator and returned without contamination in a closed loop to the methanol synthesis reactors. All process condensate and some of the excess water from the distillation section are reused this way, and the requirement for demineralized water is minimized.

The saturated natural gas from the saturator is mixed with a small amount of medium pressure steam to allow exact control of the steam to carbon ration at 1.8 and preheated to about 500°C before it is admitted to the prereformer.

The prereformer converts the higher hydrocarbons so that the tubular reformer is fed with a more uniform gas composition containing no hydrocarbon heavier than methane. This leads to a number of advantages [6], the steam to carbon ratio can be reduced, the size of the tubular reformer, one of the high cost items, is reduced, and the lifetime of the tubular reformer catalyst is extended. Purge from the methanol synthesis is recycled to upstream the prereformer to provide hydrogen to protect the catalyst, and to permit adjustment of the H/C ratio of the reformer feed.

After the prereformer the gas is further preheated in a coil in the primary reformer waste heat section and sent to the tubular reformer. The heat provided in this coil helps reduce the size of the tubular reformer radiant section. Because of the secondary reformer downstream of the tubular, the duty of the tubular reformer is further reduced by 2/3, and significant simplifications can be made in the reformer outlet system because of the low outlet temperature of about 750°C. Only 210 reformer tubes are used for the production of 2,400 MTPD methanol.

The partially reformed gas from the tubular reformer is transferred to the secondary reformer, where the reforming is completed by catalytic partial oxidation. The oxygen is admitted to the secondary reformer through the CTS burner in the reformer neck.
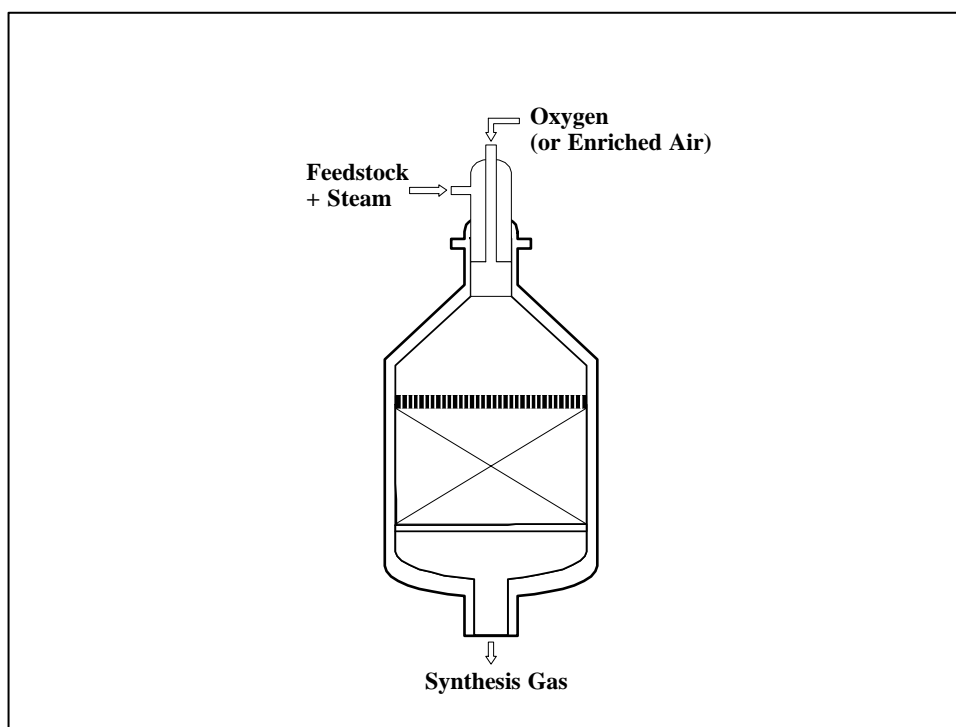
Typical Lay-out of Oxygen-fired Reformer

The most critical item in the secondary reformer is the oxygen-fired burner. This burner must operate in an aggressive atmosphere, under pressure, and at temperatures well in excess of 1000°C. In the past, burners for such applications demanded extensive maintenance and, on occasion, certain designs of burners have burnt through the refractory insulation and pressure vessel, causing significant damage.

Topsøe has developed a new generation of burners, the CTS burner design, which has eliminated the problems encountered with earlier generations [7]. These burners are designed utilizing computer based flow modeling, developed jointly by independent experts on computer modeling and by Topsøe, and verified in physical models in Topsøe's workshops. The first burner of this type was installed in a plant in France in 1992, and has now operated flawlessly for six years, much longer than any previous burners.

The Topsøe burner concept has been verified by Statoil using an in-house CFD (Computational Fluid Dynamics) model [10, 11]. This model is also used by Statoil for process studies and may also be used for analysis in case of burner irregularities.

In the secondary reformer hydrogen is consumed during the partial oxidation. In a tubular reformer a surplus of hydrogen is generated. By combination of these two process steps, a balanced synthesis gas can be manufactured, and the water formed by combustion is contained within the system. The balanced synthesis gas and the retention of combustion water are key elements for the process efficiency.

The oxygen for the secondary reformer is produced in a cryogenic air separation unit based on British Oxygen (BOC) technology. The oxygen plant produces liquefied oxygen (LOX) rather than gaseous oxygen (GOX), and a 2,000 m^3 buffer storage for LOX is installed, helping to maintain a higher on-stream factor for the methanol plant compared to the conventional GOX.

There is a significant power requirement in the oxygen plant. Because of the inexpensive and reliable electricity supply available in Norway it was decided to separate the manufacture of oxygen from the process plant proper and form a stand-alone, dedicated oxygen plant. Consequently, all high-pressure steam from the methanol plant is converted to electric power in a turbine driven turbo generator, and electricity is used in the motor driven air compressor and booster of the oxygen plant. Due to this configuration it is possible to start up and cool down the oxygen plant completely independently of the process plant. In other words it is not necessary to wait for sufficient amounts of steam to be generated in the plant or in the auxiliary boiler, before the oxygen plant is started up.

As a special feature of the oxygen plant, an air compressor, a nitrogen compressor, and the hot and cold nitrogen expanders are connected in a so-called compander configuration. In this compander, all the rotating equipment is connected by shafts and gears, and a motor is provided to start up (cfr diagram below). The compander is a new concept from BOC.
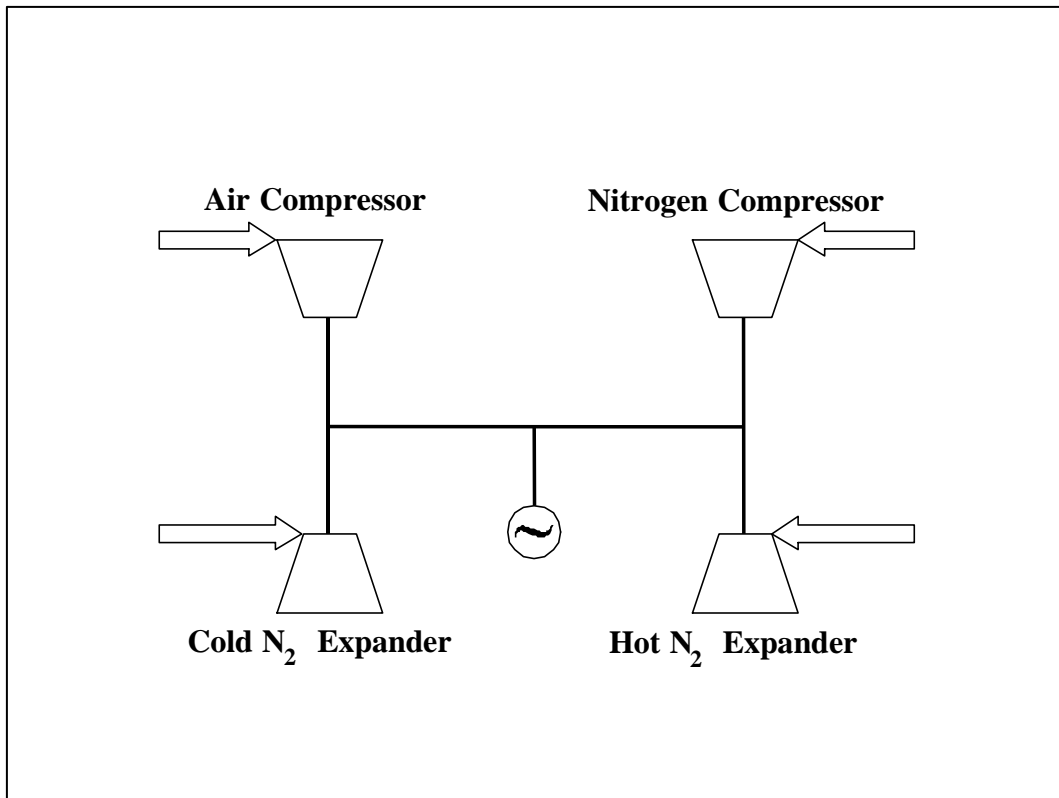
Compander

The stand-alone oxygen plant was contracted separately with the Swedish gas supplier AGA, who took equity participation in the plant. Statoil operates the plant under a long-term contract. Besides oxygen and nitrogen required for the methanol plant, excess oxygen, nitrogen and argon is produced for export [4].

After the reformer section the synthesis gas is cooled down in a boiler-superheater-BFW preheater train, where high-pressure steam is raised. Due to the small size of the reformer, the flue gas holds only sufficient heat for process preheat duties, and thus all steam superheat is supplied in the synthesis gas waste heat recovery. Therefore, the control of the temperature between the waste heat boiler and the superheater is essential. This control is obtained by applying a new "cooled by-pass" or "double tube bundle" boiler lay-out [8].
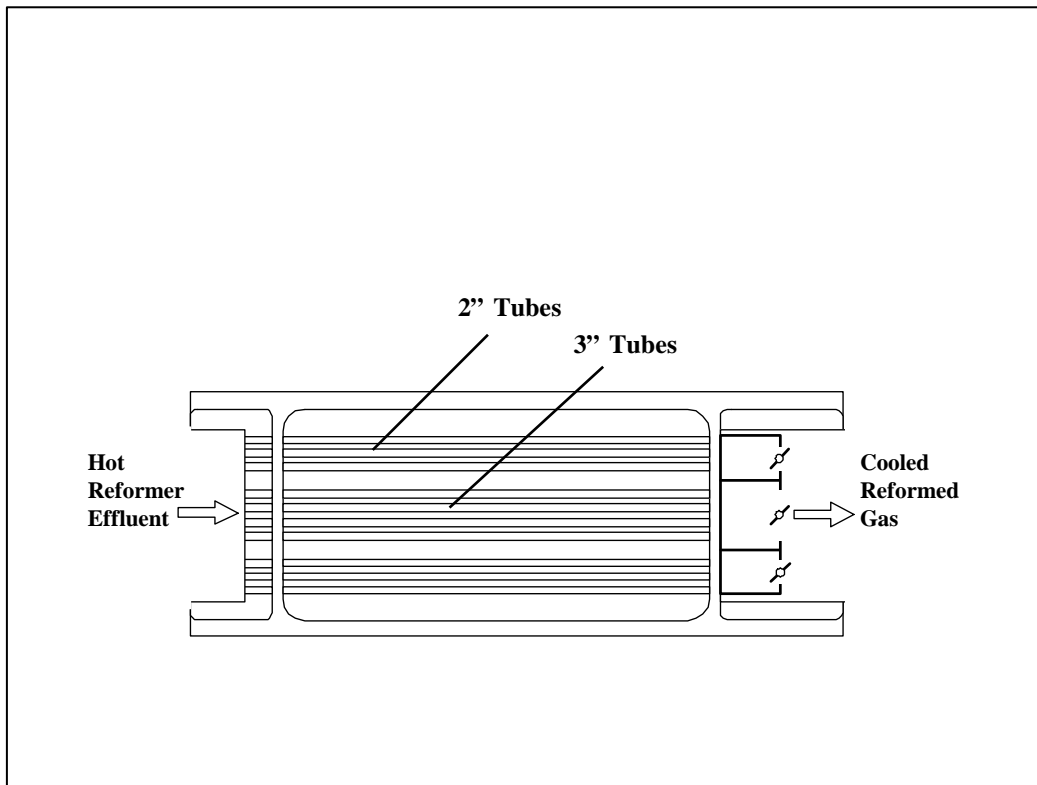
Double Tube Bundle Waste Heat Boiler (Principles)

In this lay-out both the by-pass and the main synthesis gas stream are cooled to temperatures below the kinetic limit for metal dusting corrosion, and the risk for metal dusting is reduced, also in the gas mixing zone. The cooling is obtained in one pressure shell in two concentric tube bundles with different specific heat transfer characteristic. The gas flow distribution between the 2 tube bundles is controlled by a damper on the cold side of the waste heat boiler.

After the boiler-superheater-BFW preheater section, the synthesis gas is cooled further in the reboilers in the distillation. This helps increase the energy efficiency of the plant.

Compression and Methanol Synthesis

The synthesis gas compression is obtained in a single casing, single-stage synthesis gas compressor from Nuovo Pignone. The synthesis gas compressor and the recirculator are combined on the same shaft and driven by a single MP steam turbine.

The methanol synthesis occurs in a conventional loop with two parallel boiling water reactors.

The make-up gas and the recirculating gas are combined in a heat exchanger. The gas leaves the feed/effluent exchanger in two equal flows to the top of two parallel Lurgi boiling water reactors.

The methanol synthesis reaction occurs on the tube side. The heat liberated during the reaction is removed by steam formation on the shell side of the reactors. The steam/water mixture formed rise to a common steam drum mounted above the reactors, while, at the same time, downcomers from the steam drum feed boiler feed water to the bottom of the reactors in a thermosiphon driven motion.

The concentration of inert gases in the synthesis loop is kept constant by purging part of the recycle gas to the reforming front-end.

The produced raw methanol is condensed, separated from the recycle gas and sent to a raw methanol storage tank before it is admitted to the distillation section.

The raw methanol tank provides a certain operating flexibility between the upstream and the downstream part of the plant.

Methanol Distillation

The raw methanol produced contains dissolved gases, water, and higher and lower boiling impurities. These are removed in the distillation section.

The distillation is a three-tower distillation lay-out with a stabilizer and two concentration columns operating at different pressures. Dissolved gases and impurities with low boiling points are removed in the stabilizer, and water and impurities with high boiling point are removed in the two concentration columns. The first concentration column is operated at an elevated pressure, permitting the overhead condenser to work as reboiler for the second concentration column, thereby achieving approx. twice the amount of reflux per unit of heat introduced into the concentration section of the distillation section. The result is a very low overall energy consumption of only 2/3 of the conventional two-column lay-out.

The heat required for distillation is supplied by cooling the reformed gas in the stabilizer column reboiler and a reboiler for the HP concentration column. As a supplement, LP steam is used in a second reboiler for the HP concentration column.

The Tjeldbergodden distillation section is one of the largest three-column methanol distillation sections ever constructed.

Utilities and Control

Cooling water for the plant comes from the nearby fjord, 70-75 m below the surface, and is pumped by three parallel 50% pumps. Hence, a reliable flow of a cooling medium with a constant, low temperature and low biological activity is ensured, providing very attractive efficiencies on the condensing turbines. Closed loop fresh cooling water is used for all other cooling duties. There is no air cooling in the plant.

The plant is controlled by a Bailey digital control system. All signals are transmitted to the control room, and the plant is controlled from this point exclusively. The control room features 6 control terminals from each of which the gas receiving facilities, air separation plant and the methanol plant can be controlled. 2 wall size screens are available in addition to the terminals to display video signals from surveillance cameras, plant log, alarm lists, etc.

Control Room – Photo: Øyvind Hagen, Statoil

In the basement below the control room is a dynamic simulator of the plant supplied by Kongsberg Simrad AS. Included in this simulator is a dedicated version of proprietary Topsøe software, including Topsøe kinetics and thermodynamic data. The simulator runs on a Bailey station identical to the stations in the control room and is used in the training of new operators.

Implementation of the Project [9]

The technology evaluation was completed in 1991 when the process license and engineering agreements were signed with Topsøe and Lurgi [2, 3].

At this point in time Statoil had only limited experience with respect to manufacture of methanol, while DuPont possessed considerable engineering and operational expertise. In order to benefit from this expertise, the project was initiated with a "Front End Loading" phase, inspired by DuPont's project implementation philosophy. In effect, this phase was a conceptual pre-engineering phase with the objective to ensure that the design basis for the project was well defined and that any design problems were identified at an early stage, where changes would be less costly. The Front End Loading was performed in DuPont's offices in Wilmington, Delaware, in a joint Statoil/DuPont project team with participation of engineers from Topsøe.

In a period prior to (and to a certain extent in parallel with) the Frond End Loading, basic engineering was carried out by Lurgi and Topsøe. In addition, Topsøe carried out detailed engineering on critical parts of the plant, in particular the tubular reformer.

General detailed engineering, procurement, construction, and supervision were tendered under an EPCS contract, which was won by Fluor Daniel Ltd in January 1994. Fluor performed the detailed engineering in their London offices in 1994 and 1995, with assistance from key personnel from their office in Canada and engineers from Topsøe and Lurgi.

The construction of the methanol plant as well as the gas pipeline were completed in the first quarter of 1997, and were followed by a commissioning and test period of about three months, progressing into full production in June 1997. The oil production from the Heidrun field commenced in 1995. In the interim period, the associated gas was re-injected.

It was necessary to improve the local infrastructure significantly. A new pier capable of servicing ships up to 40,000 tons was constructed and the plant site was cleared, blasting away more than two million tons of rock.

Due to the remote location and the high cost of field labour, it was decided to modularize the plant and to minimize installation work at site. While the foundations work went on at site, construction of equipment and pipe rack modules commenced at several Norwegian yards, while heavy equipment was purchased from various European vendors.

From September 1995 through most of 1996 the modules and equipment were received, installed and hooked up.

The tubular reformer was supplied preassembled in three modules. The largest module of these, the radiant section, weighed about 1,400 metric tons, and the physical dimensions were 15 by 30 by 35 metres. The reformer was manufactured by Kirchner of Venice, Italy, and sailed from Venice to Tjeldbergodden. Upon arrival in Tjeldbergodden, the reformer modules were jacked up and rolled off to their final destination on a 232 wheel, 58 shaft transporter (photos). The refractory lining of both reformer and collector was installed before shipment.

Photos: View of Tubular Reformer under Transport at Site

The cold box for the oxygen plant, the distillation columns and other major vessels were transported to the site and erected fully dressed. This project was the first where a cold box (height 71 m, weight 433 ton) was installed in one module. The low-pressure concentration column was the heaviest lift at 460 tons (photo).

LP Concentration Column

Cold Box

The modular construction was a positive experience. The modules were generally delivered on time and according to specifications, and even the largest and heaviest modules could be handled without troubles.

In addition to process license and basic engineering, Topsøe's scope of supply comprised catalysts, training, supervision, start-up assistance and supply of certain critical parts, including burners for the secondary oxygen-fired reformer. The catalysts and the burners were delivered in the fourth quarter of 1996.

At the start of the methanol project, Statoil established a firm safety policy, which put safety in design and safe working practices in the front seat.

The safety objectives were reflected in all contracts and closely followed-up by the project team. Good performance was acknowledged and an improvement system was put in place to register and learn from all incidents and near accidents.

The result has been a very satisfying safety performance with no serious accidents or permanently injured personnel. At project completion in April 1997, only 15 lost work time accidents had been reported on the basis of close to 6 million accumulated man-hours.

Plant Start-up and Initial Operation

Mechanical completion and handover of the plant took place from November 1996 to April 1997 and was closely integrated with the commissioning and start-up activities. The reformer dry-out was initiated late April 1997 and continued for 10 days. Catalyst was loaded and activated in May 1997. Natural gas was first introduced to the plant on 30 May 1997.

The methanol plant was officially inaugurated on 5 June 1997, and the first methanol was produced on the same day. The start-up was smooth and fast, and the plant was operating at 85-90% of design capacity within three days. The plant was kept at this level for a period of about 2 months. During this period, a number of bugs in the instrumentation and the control system were corrected, and a bottleneck was identified in the oxygen plant.

The problem in the oxygen plant originated from the compander, where the cross shaft started to vibrate at around 90% of required load. This cross shaft was originally 50 mm diameter, and it was replaced by BOC at short notice with a 60 mm cross shaft. This replacement permits the oxygen plant to operate at 100-105% of required load without vibrations.

By 6 August, 1997 the bottleneck was removed, and the plant reached its design capacity of 2,400 tons/day. A stable production of 103% of design capacity was demonstrated and the performance test run was performed on 11-14 November 1997. A stable production of 105% of design capacity was demonstrated in June 1998, and the plant continues to operate around this production level.

After the initial operation period, the new equipment was evaluated as follows:

Saturator
The saturator operated according to design, and it has not caused any problems. In fact, it proved to have a stabilizing effect on the plant because pressure excursions on the medium pressure steam could not spread to the process. The medium pressure steam pressure is 44 bar. In the saturator, a steam pressure of 28-30 bar is sufficient, because the water on the process side is evaporating against its partial pressure only.

Thus, the saturator has provided an extra convenience and safety, in particular during start up of the plant.

Prereformer

The prereformer has operated according to design. C_2+ is reduced from about 17% to a level that permits operation at a steam to carbon ratio as low as 1.8. Due to unexpected deactivation, believed to be caused by organic sulphur, a new charge of prereforming catalyst was installed during the September 1998 turnaround. The front-end process is slightly modified to eliminate this problem.

Primary Reformer

The primary reformer was inspected after dry-out, and it looked fine. The reformer is operating at exit temperature slightly lower than design, indicating a catalyst activity in excess of design. The reformer tubes are inspected visually at regular intervals and show no sign of hot banding or other temperature mal-distribution. No detrimental effects of the low steam to carbon ratio have been identified. The pressure drop over the tubes has remained constant at 3.6 bar.

Refractory

After the transportation of the reformer, minor damages were found on the inner layer of castable refractory, which was deemed not to compromise the thermal insulation. Except for cleaning, no attempts were made to fix the refractory before the start-up. The soundness of the refractory was proven after start-up, since no hot spots have been found in connection with these minor damages. Later, the transfer line has been inspected with video camera, and no changes have been found in the condition of the refractory lining.

In the field weldings between the reformer sections, a few hot spots have developed. Metal temperatures have been found to be within the acceptable. During the scheduled 1998 turnaround the refractory in connection with these hot spots was inspected and repaired as necessary.

Secondary Reformer

The secondary reformer has performed according to design. Oxygen consumption is as expected and residual methane concentration in the synthesis gas is in accordance with design.

In accordance with Topsøe design philosophy, the secondary reformer is not water jacketed, and may thus be visually surveyed at all times. In particular, the conical part of reactor has been surveyed, because the conical part harbours the flame with the highest temperatures. The CTS burner has proven itself, and no signs of hot spots have been seen.

During the first days of operation, the level control in the liquid oxygen storage had not been calibrated, and the storage was allowed to overfill during a brief absence of the operator. The overfill resulted in liquid oxygen in the oxygen header. The liquid oxygen evaporated into the oxidant stream and reduced the temperature, compromising the flow control and showing false low flow of oxygen. The plant tripped on high temperature exit the secondary reformer. After the trip, the overflow in the liquid oxygen storage was eliminated, and the plant was started up again without problems. Subsequently, the level control was calibrated, and the flow controller was changed into a temperature compensating type.

Air Separation Unit

As mentioned above, certain problems were identified in the oxygen plant. In addition to the vibrating cross shaft, the flow control valve on the oxygen was too small. In order to obtain

the required flow, the plant was for a period operated with the valve by-pass is fully open, while the control valve was about 75% open. This flow control valve has been replaced with a higher capacity valve during the September 1998 turnaround.

Waste Heat boiler
The new lay-out of the waste heat boiler with concentric tube bundles has been demonstrated. The outlet temperature is controlled according to design. However, the thermowell for the TIC controlling the flow distribution between the tube bundles had been made in alloy 800 as result of a fabrication error. This thermowell succumbed quickly to metal dusting and started to leak. When the leak was discovered, the thermowell was replaced with an alloy 601 thermowell in accordance with design, and this well has shown no signs of metal dusting.

Distillation
The three-column distillation section proved easy to operate. The columns are started up against closed valves and with full recycle, and when temperature and pressure profiles are right, the valves are slowly opened. The procedure to start-up from cold stand-by to stable 100% load takes about 12 hours.

Grade AA quality was obtained from the very start. Besides, IMPCA specifications and more restrictive specifications are produced for certain clients.

Over a period of 3 months, the product methanol intermittently developed a slight "fishy-smell" caused by TMA (TriMethylAmin). In order to eliminate this problem, process parameters were adjusted and an analytical method for TMA testing was implemented. The TMA analysis has proved very reliable down to concentrations below 10 ppb and has proven a very valuable tool in optimizing distillation parameters and eliminating the product odor.

Catalysts

All catalysts have till date performed as per or better than expectations with the exception of the prereforming catalyst for reasons explained earlier. In particular, the methanol synthesis catalyst performed well, obtaining a carbon efficiency in the methanol synthesis of 1.3% above design.

Performance Test Run

During the performance test run the following performance was realized:

Guarantee	Guaranteed Value	Realized Value	Deviation
Production, ton/h	100	103.6	+3.6%
Quality	Grade AA "+"	Passed	-
Natural gas consumption, GJ/MT(Gcal/MT)	29.64 (7.09)	28.74 (6.88)	-3.0%
Total works cost (globalized utilities), index	100	80	-20%

Thus, excellent performance was achieved with higher production and lower natural gas and utility consumption than guaranteed.

Conclusion

During design, construction and initial operation all the original project objectives have been achieved. The plant has proven to be safe, clean, efficient and the reliability has progressively been improved to design objectives.

Certain minor problems originating from the utilities rather than the methanol process were encountered and solved during the start up and initial operation. The reforming, the synthesis and the distillation sections have only been minor concerns during the initial operation period.

With the methanol plant at Tjeldbergodden, Statoil has found a value adding application for part of the associated gas in the North Sea. The methanol plant is the first major industrial facility in the region, which has so far been dominated by fishing, farming and small industry. 100 jobs have been created for operation and maintenance of the oxygen and methanol plants, by introducing innovative and best practices in a flat, non-hierarchical organization with multi-functional work teams.

For Topsøe, the co-operation with Statoil has been outstanding, in particular because Statoil has been positive towards the application of new technology. The willingness of Statoil and Conoco to embrace new technology has created a unique facility with innovative process features. These features make the plant not only among the most efficient, but also the most environmentally friendly methanol plant in the world today, and with the location at Tjeldbergodden, the plant is tied directly into large reserves of low cost gas, and located close to the trading hub, Rotterdam.

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