Dutch covenant offshore methane emissions reduction 2019-2020

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Introduction

Methane is a notorious greenhouse gas, much stronger than carbon dioxide. In Europe, methane contributes 10% to the effect of greenhouse gas emissions. The reduction of methane emissions contributes therefore significantly to a delay of climate change and to an improvement of the air quality. Besides that methane emissions reduction also leads to an improvement of process safety. Following the agriculture sector and the waste disposal sector, methane emissions originating from the energy sector are the third source in size to the anthropogenic methane emissions. The oil and gas (O&G) producing industry belongs to this energy sector.

In order to meet the Paris agreement on climate goals, the Ministry of Economic Affairs and Climate Policy in the Netherlands and the Dutch oil and gas producing companies (via NOGEPA) signed an agreement, a so-called covenant, to reduce the emissions in the offshore sector. In the covenant it is agreed that the Dutch offshore O&G-sector will reduce its methane emissions by 50% before 2021, relative to its 2017 emission levels. The covenant follows an earlier NO_x-emissions reduction project in the offshore O&G-sector.

In the covenant, it is agreed that methane emission reduction measures will be implemented up to the cost level of the avoided greenhouse gas equivalents. The cost level is determined by the price of carbon dioxide allowances in the European Emissions Trading System. State Supervision of Mines (SSM) is the regulator for the execution of the emissions reduction plan.

Dutch O&G-sector methane emissions trendline

In figures 1 and 2 (starting in 1990) the yearly emitted quantity of methane and the yearly oil and gas production by the Dutch O&G-sector are plotted. During the first years, the methane emission reduction was realised under a previous covenant with the Dutch O&G-sector.

From 1995 until 2010 this earlier covenant was in place, with targets specified for periods of four years. Under this covenant for each period specific reduction targets were agreed between the Ministries and the industry on environmentally hazardous or climate changing substances (Methane, NO_x, SO_x, VOS, waste and discharges to sea).

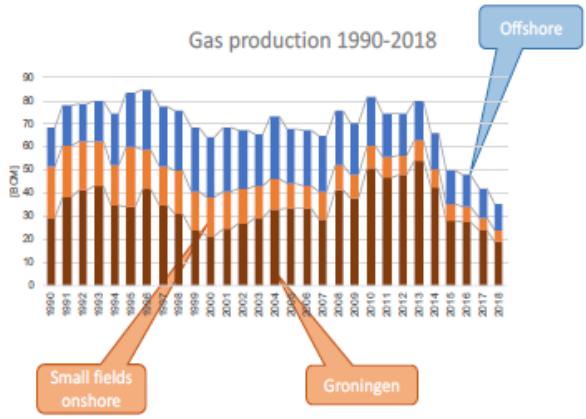

Figure 1: Total production of natural gas (in Bm^3) during the period 1990-2018, split into the production from the Groningen field, the small onshore fields and the offshore production.

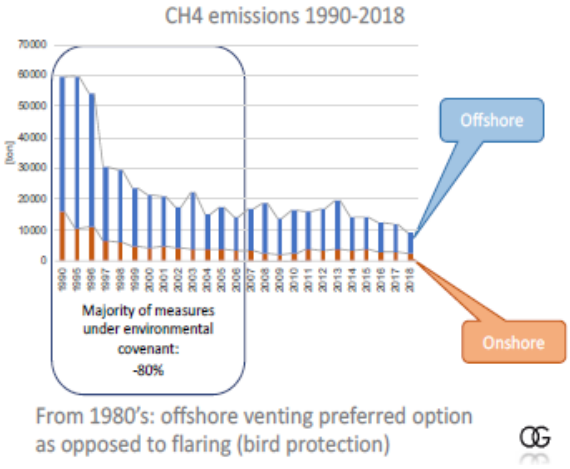

Figure 2: Methane emissions (in tons) during the period 1990-2018 for the Dutch O&G-sector, split into the contributions from the Groningen field, the small onshore fields and the offshore sector.

The origin of the current covenant

In the Netherlands, the European directive on industrial emissions (2010/75/EU) for onshore installations has also been implemented for the offshore O&G-sector in Dutch legislation at the beginning of 2019. As a consequence, during the years 2017-2019 NO_x-reduction measures have been implemented in the Dutch offshore O&G-sector. Operators were given the option to net and aggregate NO_x-emissions of combustion installations not meeting the legislation with the emissions of other combustion installations for which NO_x-emission reduction measures were taken and which combined perform better than the legislation prescribes. As a result of this "netting option" the emissions were reduced more than the improvement that would have materialised if each emission source would have had a performance exactly meeting the legislation. Also, (because of this netting) the total financial investment was less than it would otherwise have been.

A few platforms could not meet cost efficiency under the new requirements, even with the "netting" option because they are nearing the end of production. Therefore, an exemption was made in the regulation for platforms ending production by the end of 2021.

After the successful technical improvements under the earlier NO_x-project SSM stimulated the operators to look further for methane emission reduction possibilities in the offshore sector, as methane emissions are one of the major causes of climate change. The offshore operators started to work together to seek methane emission reduction possibilities. The following steps were taken in the process, which resulted in the covenant:

1. The working group made an overview of all methane emission sources in the Dutch offshore O&G sector;
2. All operators agreed to determine the methane emissions of offshore installations using the same format: the methane emissions determination plan;
3. In this plan a ranking list (from most accurate to least accurate) is prescribed with possible techniques, which can be used to determine the methane emissions, for each type of emission source;
4. The working group discussed the technical feasibility of reduction possibilities per emissions source;
5. The financial investment of each reduction measure was estimated. The avoidable methane emission was linked to the as a consequence avoidable greenhouse gas equivalents per emission source;
6. The net investments required to reduce the global warming equivalents were calculated;
7. This cost was compared to the price of the CO_2 in the European Trading System. If the cost of a reduction measure was less than this CO_2-price of € 20,- per ton[1], the measure was supposed to be taken, if the price was above, it was not necessary to take the measure at this moment. More effort is taken to minimise the vented quantity of gas, not resulting in additional safety risks. Many measures could be taken, because the gas, which was no longer vented, can be sold.

The result of all these steps was written down in the covenant with the Ministry of Economic Affairs and Climate Policy. It was agreed that 50% methane emission reduction of the overall offshore O&G-industry, has to be realised before the end of 2020 in comparison with the emission in 2017. This corresponds to an emission reduction of 4676 ton methane annually.

Realistic reduction measures result in significant reductions

A pragmatic approach has been chosen in the search to methane emission reduction possibilities in the O&G-production process: Economically feasible and solution driven with a timeline of two years, using as much as possible best available technologies (BAT).

[1] In the calculation the emission factor for 1 ton methane corresponds to 28 tons CO_2.

Emission reduction has been implemented by:

- Focussing on main sources:
  - Non-continuous blowdown,
  - Continuous process vents,
- Avoiding focus on small emitters, which are perceived BAT and
- Seeking for measures which are high on the abatement ladder.

This resulted in:

- Large emission reductions by addressing main sources,
- Shift towards more advanced state of technology and
- Venting reduction will be realised by minimalization of vent emission and re-use of gas.

The following measures can be taken at the acceptable price level:

Emission source	**Measure**	**Prevented annual methane emission (T/y)**
Leaking process gas valves	Minimising leakage by repairing valves and adjusting repair procedures	1205
Multiple process sources	Process simplification (centralise processes and reduce emission sources)	738
Stabiliser vent gas	Reuse as fuel gas	672
Over reporting	Improved reporting based on flow measurements	559
Methane purge gas	Eliminate by using nitrogen purge gas	545
Condensate flash gas	Eliminate internal process leaks by closing valves and optimising process control	260
Stabiliser vent gas	Reduce by increased stabiliser pressure	258
Methane purge gas	Reuse as fuel gas	180
Compressor seal leakage	Seal gas recovery system and reuse gas as fuel gas	144
Process evacuation/trip	Reduce number of blow downs	131
Glycol unit strip gas	Reduce strip gas rate	46

The overall results have been plotted in figure 3 and figure 4. Figure 3 shows the methane emissions per emission source in 2017. Figure 4 shows the methane emissions per emission source at the end of 2020 after taking the emission reduction measures. The size of the dots reflects the quantity of emitted methane and the colour of the dots represents the operators. The size of the dots clearly decreased from the first to the second graph.

There is also a clear shift from the left side of the graph to right side, indicating that more environmentally friendly techniques have been implemented.

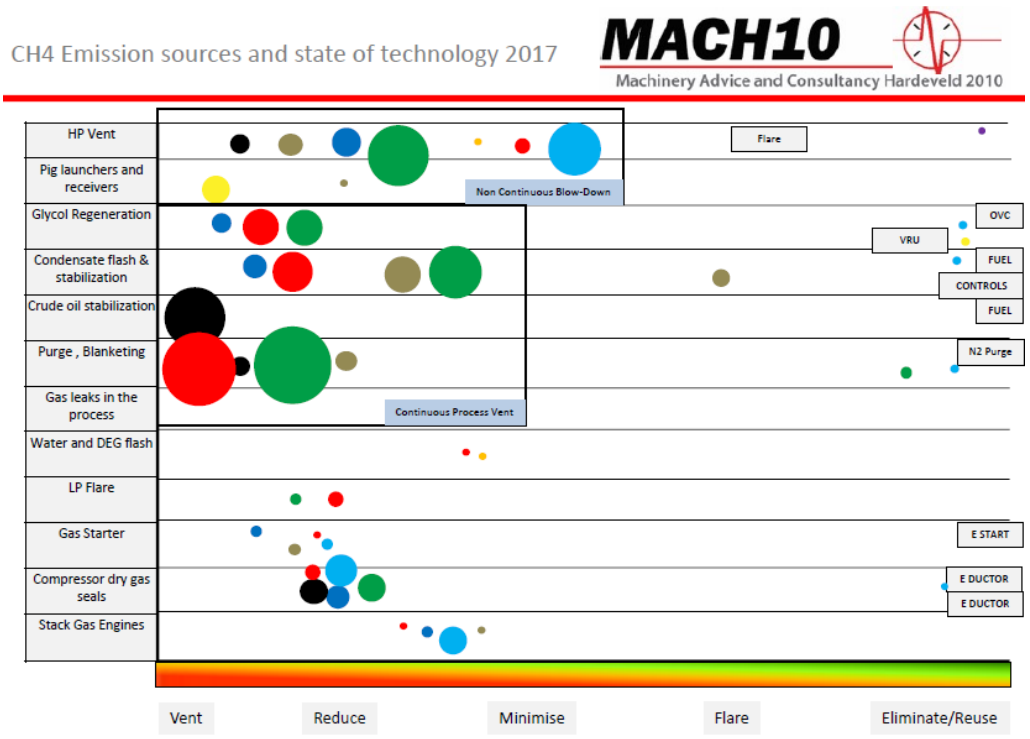

Figure 3: Total methane emission per emission source in 2017, before the methane emission reduction measures were implemented. The size of the dots reflects the total quantity of methane which has been emitted. The colour of the dots represents the operator.

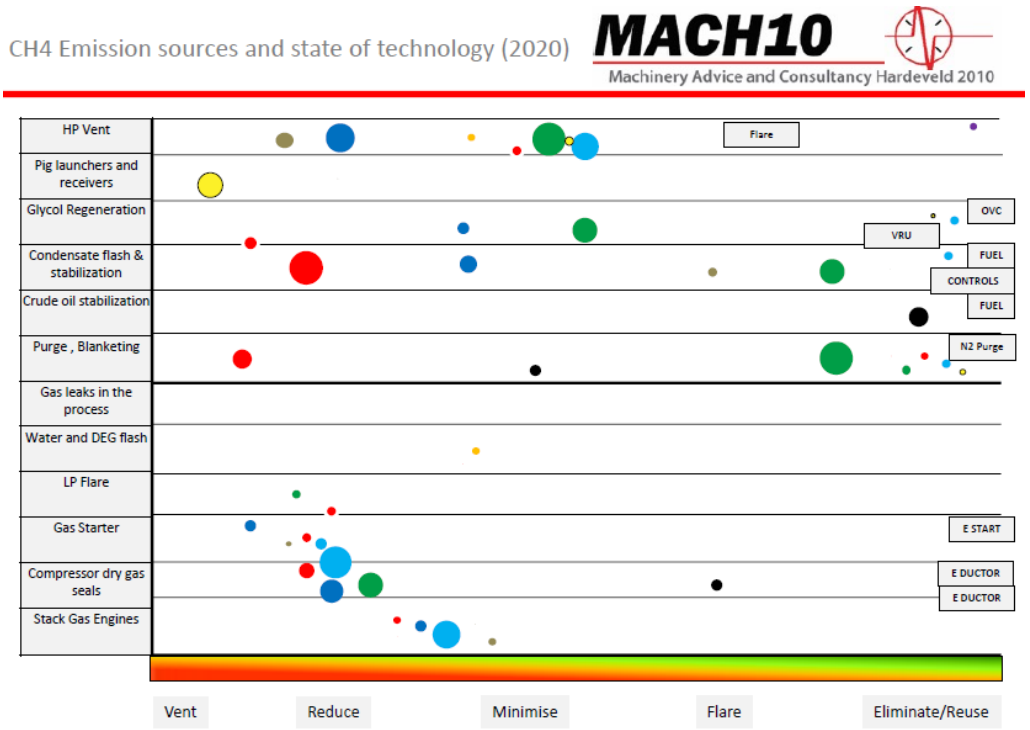

Figure 4: Total methane emission at the end of 2020 after the methane emission reduction measures have taken place.

International context

The European Commission has written a strategy for methane emissions. The Netherlands oil and gas exploration and production association (NOGEPA) contributes actively to this process and shares knowledge which is gathered in the methane program with this consortium and the European Commission. The final version of the report will be published by the end of 2020.

Conclusion

Surprisingly large environmental improvements of the offshore industry have been achieved with relatively modest financial investments. A yearly methane emission reduction of 4738 tons has been achieved. Partially, this can be explained, because in The Netherlands offgas venting is preferred to offgas flaring due to the expected negative impact of flaring on bird migration.

Even without regulation the offshore oil and gas industry implemented these environmental improvements. Good communication from the regulator, explaining the benefits and urgency of these improvements, was sufficient, to make the industry act proactively in making environmental improvements.

SSM checks whether the reported emissions are correct and whether the emission reduction projects have been realised.