

Description of the Thermomechanical Cuttings Cleaner (TCC)





Web: www.thermtech.no

Project No: 7320 Project name: **Marketing and sales** Document no: **00534** Prepared by: Anders Haugen

Date:
13 Feb. 07

Description: Description of the TCC

Revision: **A.5**

Approved by: Erik Michelsen

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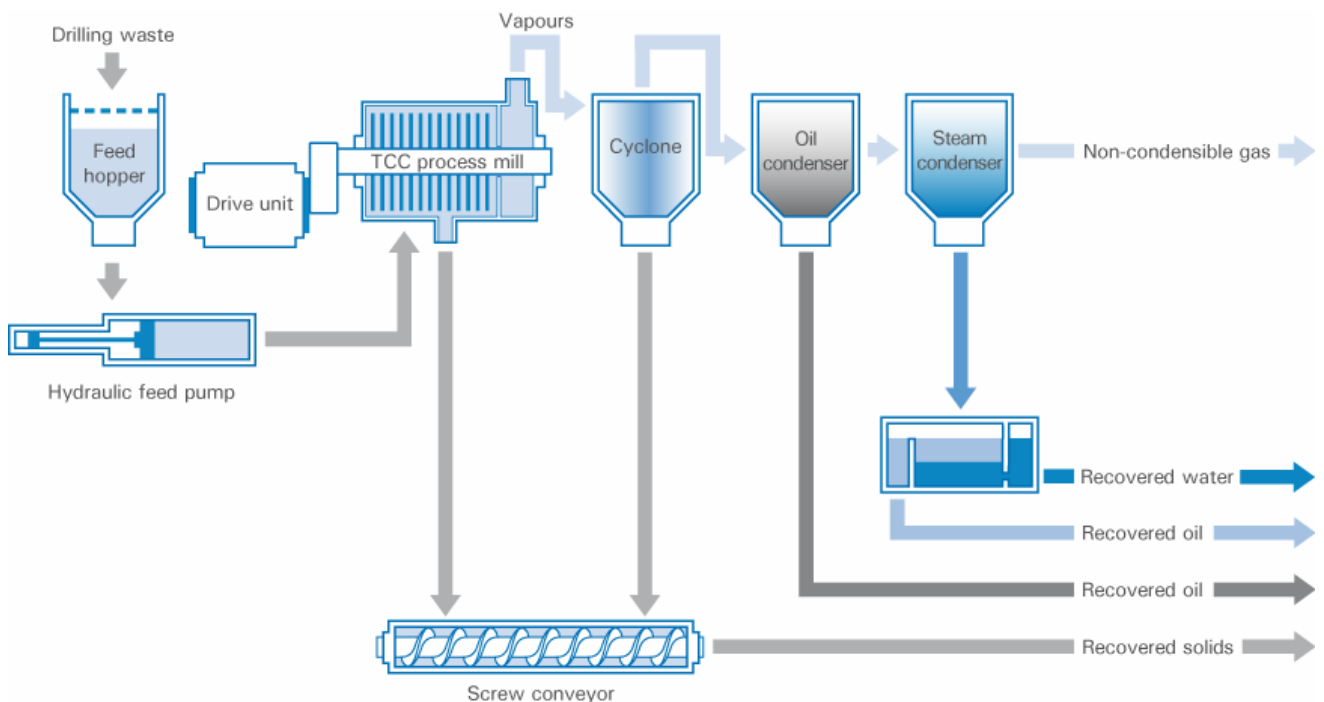
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Description of the Thermomechanical Cuttings Cleaner (TCC)

The TCC is a separation technology developed by Thermtech and intended for separation of the various components in drill cuttings where Oil Based Mud (OBM) is used during the drilling operation. In the TCC the drilling waste is separated into three main components, mineral solids, base oil and water.

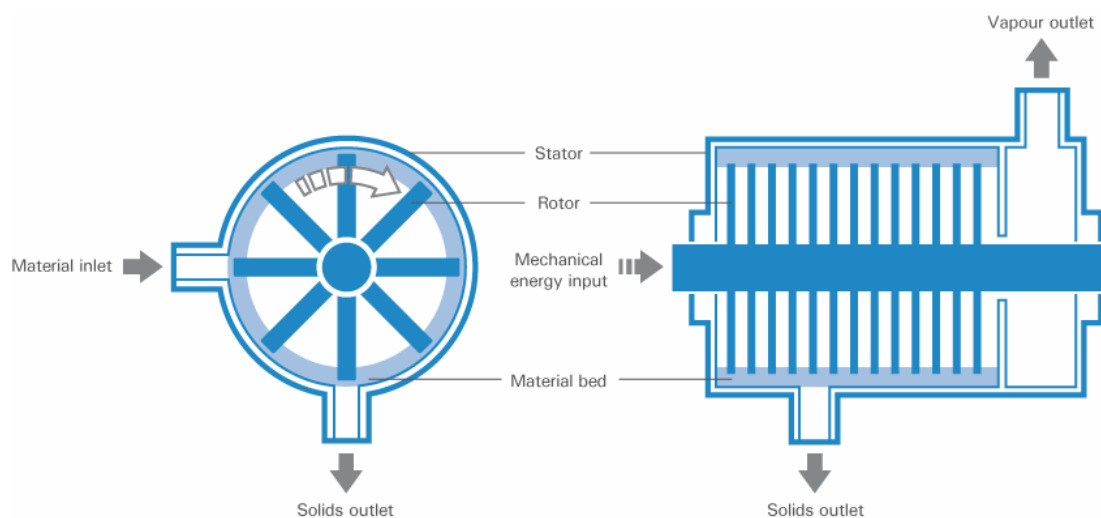
Flow through the process

The principle is to heat the waste stream to a temperature higher than the evaporation temperature of the base oil (normally 250 to 300 degrees Celsius). The oil and water will then evaporate and will be condensed in separate condensers for oil and water.



Although there are various thermal separation technologies in the market, the TCC has some distinctive features caused by the way the TCC is heating the waste. In the TCC the waste is heated by transforming kinetic energy to heat by friction. The core of the technology is a drum shaped chamber (approx. one metre diameter and one metre long), through which a shaft with a series of hammer arms is mounted. This chamber is referred to as the process mill. An electrical motor or diesel engine drives this shaft.

Functional description



Prior to start up sand is fed into the chamber, and the shaft is set in motion. The particles will then be forced towards the inner wall of the chamber where the end of the hammer arms will beat the particles and create frictional heat. The hottest spot in the process stream is actually the waste itself.

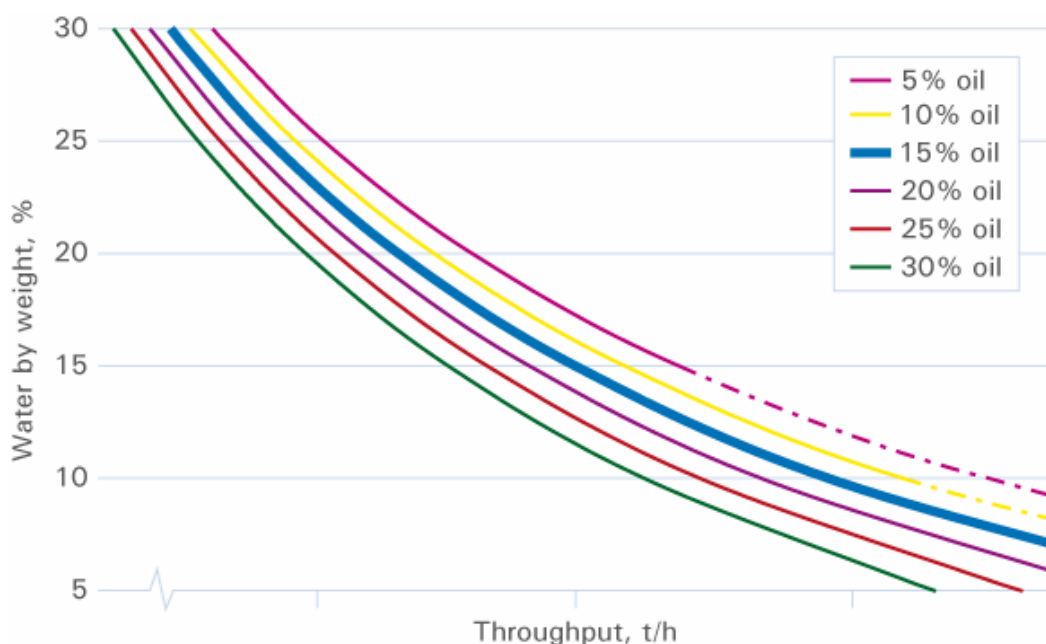
When the temperature is high enough, the waste is fed into the chamber. The liquids in the waste will evaporate immediately and leave the chamber as vapours after a few seconds. The oil and water vapours are then condensed in separate tanks for water and oil. New waste is continuously fed in when the temperature raises, and dried solids are fed out when the load on the motor increases to its set point. The process is controlled by a fully automatic PLC system.

A detailed description of the equipment is found in Scope of Supply.

In the TCC the highly valuable base oil will be under influence of high temperature only for a few seconds, resulting in a very high quality of the output oil which can be re-used in new OBM. Further information about the output streams is found below.

Capacity

Capacity of a TCC depends first on engine size. However, in any thermal desorption process, a significant proportion of the total energy consumption is related to changing the water from liquid to gas phase. The capacity, therefore also depends on the amount of water in the waste.



A TCC 700 kW unit will have a throughput of approx. 3 tons per hour with a solids/water/oil ratio of 70/15/15 % by weight.

Output qualities

The quality of the output streams will depend on the components in the waste. However, if conventional base oil is used in the OBM, the equipment will meet the following qualities of the output streams provided the equipment is maintained according to the maintenance programme.

	Specs	Best recorded
Oil on cuttings, ppm	<2000	200
Flashpoint reduction of recovered oil, °C	<5	0
Solids in recovered oil, ppm	<1000	<20
Water in recovered oil, %	<1	<0.5
Oil in recovered water, ppm	<1000	<50



Typically, the qualities will be somewhere between the Specifications and the Best recorded.

Alternative methodologies and technologies

There are several other ways to deal with OBM cuttings.

Other thermal technologies

Competing thermal technologies (also referred to as “thermal desorption units”) are heating the waste through large heated surfaces in a heated screw conveyor, a disc dryer or a rotary kiln. The most known are the SRD/Soil Recovery (recently acquired by National Oilwell Varco), the TPS/Thermal Phase Separator (MISWACO) and the Porcupine/Bethlehem (KMC Oiltools).

The indirect dryers have a significantly larger footprint which means a very limited mobility compared to the TCC. The TCC can relatively easily be moved between different locations.

All the indirect dryers are depending on a heating medium that has a significantly higher temperature than the evaporation temperature of the oil in the waste. These large surfaces cause additional risks for accidents, fires and explosions. On a TCC the surfaces are much smaller, the maximum temperatures are lower and all heated surfaces are properly insulated.

The size and weight of the equipment and the safety measures are the main reason why the TCC is the only thermal technology that is qualified for offshore use in the North Sea, and most probably the only existing thermal technology with the abilities of offshore operation.

In the indirect dryers, the oil is under high influence of high temperatures for a much longer period of time. In the TCC the retention time is only a few seconds, whereas in the indirect dryers it will be up to ½ hour. This has implications for the quality of the output base oil, and the experience with indirect dryers is that the oil is degraded, which is not the case with the TCC. Beside the environmental benefit of being able to re-use the oil in new OBM, this also has a business case implication since the price of new base oil is rather high compared to the value of waste oil that can only be used as fuel.

Re-injection, bioremediation, landfill and incineration

All these methods can in principle be used, but none will be able to recover the base oil. From a cost/benefit viewpoint the value of the recovered will often lead to a financial benefit favourable to the TCC. In addition there is an increased environmental focus on utilization of the components in waste streams in general, which is regarded as favourable compared to these disposal activities.