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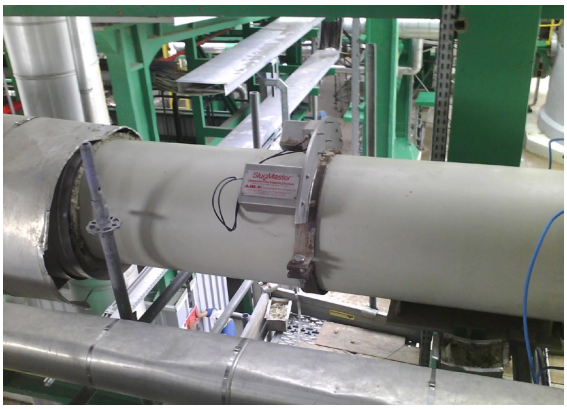
ABLE SlugMaster Delivers In Kashagan Field

Kashagan Field – SlugMaster Flow Computer

Kashagan Field – SlugMaster Time of Flight Transducers



Kashagan Field – SlugMaster Reflexor Transducers

Discovered in 2000, the Kashagan Field is an offshore oilfield in Kazakhstan's zone of the Caspian Sea. It extends over a surface area of approximately 75 kilometres by 45 kilometres.

The reservoir lies some 4,200 meters below the shallow waters of the northern part of the Caspian Sea. It is estimated that Kashagan has recoverable reserves of approximately 13 billion barrels of crude oil and commercial production began in September 2013. The oil is light with 45 API gravity and a hydrogen sulphide (H_2S) content of up to 19%. The Kashagan field also contains around 52 tcf (trillion cubic feet) of associated gas, most of which will be re-injected offshore to improve oil recovery rates.

The field is operated by the North Caspian Operating Company (NCOC) with partners Eni (16.81%), Royal Dutch Shell (16.81%) ExxonMobil (16.81%) China National Petroleum Corporation (8.4%) and Inpex (7.56%)

The development of Kashagan, in this harsh offshore environment, represents a unique combination of technical and supply chain complexity. The combined safety, engineering, logistical and environmental challenges (sea ice during the winter, temperature variation from -35 to 40°C) make it one of the largest and most involved oil megaprojects currently being developed anywhere in the world.

The crude and residual gas products, having been roughly separated offshore, are delivered for treatment to the Bolashak Onshore Processing Plant, located 40km north west of Atyrau, Kazakhstan, where the world's largest slugcatcher buffers all production, including the slugs, before it is sent to the gas and liquid handling facilities. When oil is pumped over a considerable distance, large pockets of gas and/or congealed oil often build up at elevated points in the pipeline. As the velocity in the line increases, the gas pockets and congealed oil are dislodged and flow towards the processing plant.

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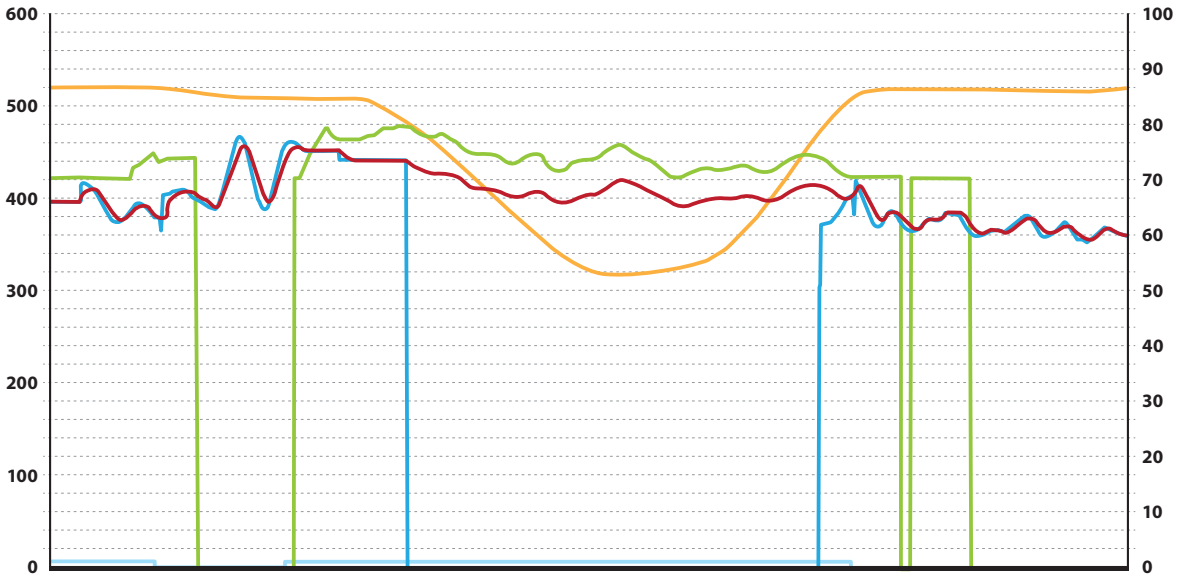
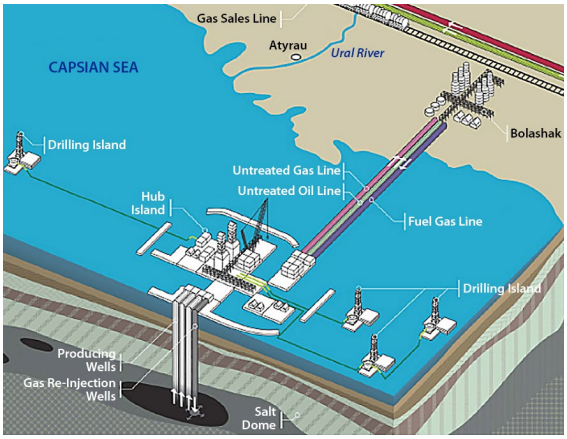


Fig 1. SlugMaster Seamless Transition

To ensure accurate flow measurement under gas breakout conditions, Petrofac International Ltd, contracted ABLE Instruments & Controls Ltd, to install its SlugMaster Ultrasonic Flow Metering System on Crude Oil Trains 1, 2 & 3 of the onshore inlet manifold. The SlugMaster uses dual ultrasonic DD (Dynamic Density™) technology and was specifically developed by ABLE to consistently measure liquid flow during challenges arising from changes in process parameters when process density changes with gas volume fraction. Transit Time ultrasonic flow metering is used during periods of low aeration with intelligent switching to Reflexor metering during heavy aeration, slugging, slurry or solid particle entrainment.

ABLE's Transit Time ultrasonic flow meters with Dynamic Density™ compensation have exceptional measurement accuracy, even at relatively high levels of aeration. In the ABLE SlugMaster® system, this accuracy is used to calibrate the tandem Reflexor meter during the window when both meters are able to operate due to low process aeration. By calibrating the Reflexor to the Transit Time and Density input at the point where the latter is just failing to measure, the meter becomes vastly more accurate than a standard Reflexor out of the box.



Ordinarily, the changeover point between these two technologies would be difficult to achieve, yet with the ABLE SlugMaster®, a precise and seamless changeover between the two metering methods is attained with a Patented Algorithm that facilitates an accuracy exceeding that which could be achieved from either technology, in isolation, at the transition point.

The graph above is an example of real process data for separated crude as metered by the Kashagan Train 1 SlugMaster. The Yellow trace is tracking Density. The blue line represents the Transit Time meter as it experiences increased gas entrainment and becomes unstable until the flow measurement is eventually lost. Before this point the Reflexor meter, represented by the green line, picks up the measurement. The ABLE SlugMaster software cross calibrates the Reflexor to the Transit Time referenced to density so that a calibrated Reflexor flow is developed and an accurate transition is achieved.

The non-invasive nature of the SlugMaster's clamp-on technology means that it is immune to the potentially corrosive effects of the high H_2S content of the process. The extent of this problem can be measured by the fact that the original steel pipeline running between the drilling islands and the hub is being replaced by a steel pipe with nickel alloy clad. This work is expected to be completed by September 2016.

For further information and access to technical papers and independent tests on SlugMaster such as carried by NEL please refer to the SlugMaster section on our website..

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