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MEASUREMENT TECHNOLOGY

Pressure Measurement for Oil Production

Application:

Oil Production

Pressure measuring system (digital pressure transmitter, mechanical pressure gauge and diaphragm-seal)

Pressure gauges for crude oil must be able to withstand highly adverse environmental conditions often including extreme ambient temperatures. A special combination pressure measuring system devised by LABOM has increased the reliability and precision of pressure measurement for an oil extraction company in Emsland (Lower Saxony, Germany).

Combination pressure measurement for oil production under difficult conditions

More reliable measuring technology means fewer extraction pump shutdowns

From production of gasoline to manufacturing plastics, crude oil is the vital starting point for countless products that we use everyday. Crude oil has become such an important commodity that the relatively small oil deposits in Germany are also being extracted, even if this local production covers only 3 % of German domestic demand. In Germany, the largest oil deposits are located in the north. Compared to the world's largest oil fields, it is far more costly and time-consuming to extract oil from German deposits, which are found in small and geologically complex locations. These difficult conditions also impose tough requirements on oil-extraction systems and technology. A special combination pressure measuring system from LABOM has benefited an oil production company in Emsland (Lower Saxony, Germany) by providing greater reliability and precision in pressure measurement for its production system.

The task: When extraction first begins, the crude oil flows upward by itself due to the natural ambient pressure exerted on the deposits. As more and more oil is removed, the resulting pressure drop causes less oil to flow upward naturally. Depending on pressure conditions, additional, secondary oil recovery methods such as water injection or thermal methods (steam and thermal gas injection) are employed to increase the average yield from 20 % to 45 % of what is theoretically available. Under these brutal conditions, the instruments used to measure crude oil pressure often have to withstand very high ambient temperatures. Although pressure transmitters with bourdon tube previously used did have the desired mechanical gauge display, they often failed at high temperatures, leading to frequent safety shutdowns of the extraction equipment as well as repeated repairs of the measuring devices (downtimes).

The solution: LABOM combined its PASCAL CV pressure transmitter with a mechanical Bourdon-tube pressure gauge and a universal diaphragm-seal into one pressure measuring system that outputs a signal of 4 to 20 mA and will function reliably at temperatures up to 85 °C.

The customer benefits: Using LABOM's combined pressure measuring system, the oil production company has experienced fewer

production downtimes at high operating temperatures. There are now far fewer safety shutdowns of the oil extraction pumps as well as fewer failures and repairs of the pressure measuring instruments.

Beyond this, the customer has benefited from more accurate signal transmission. In fact, LABOM increased the accuracy class (linear deviation) from < 1 % to < 0.1 - 0.2 %. Furthermore, LABOM significantly reduced the amount of 'dead space" (inaccessible area) in the measuring system. By doing so, LABOM eliminated the problem of zero-point shifts due to temperature hysteresis. This means the customer no longer has to reset the devices, thus increasing system availability and decreasing costs.

Within this combination pressure measurement system, PASCAL CV has a number of different process connections, as well as smart module technology, for displaying, switching and communicating. These function modules can be replaced or upgraded without major cost and effort and without having to remove the device from the process system.

If desired, customers can have their pressure measuring system fitted with additional inductive contacts to ensure that digital data signals continue to be transmitted in the event of system failure.

Before (left): mechanical pressure transmitter with bourdon tube. After (right): digital pressure transmitter with mechanical gauge.

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DEVICE DESCRIPTION

Pressure measuring system, consisting of a digital pressure transmitter, mechanical pressure gauge and diaphragm-seal

- PASCAL CV digital pressure transmitter
  Output signal: 4 to 20 mA, HART® protocol or
  PROFIBUS PA optionally available
  Explosion protection rating: II 2G EEx ia IIC T6
- Mechanical pressure gauge with Bourdon tube, model series BH
  Inductive contact optionally available
- Process connection:
  Diaphragm body of stainless steel with diaphragm of Hastelloy C276
  Design complies with acid gas guidelines
- Accuracy:
  Linear deviation < 0.15 %
  Hysteresis < 0.05 %
  Repeatability < 0.05 %