

Density Measurement At BP Grangemouth

BP Chemicals produces over one and a half million tonnes of chemicals and plastics each year from its 190 hectare Grangemouth site. Able Instruments have been active in many areas of the plant over the years. One of our more recent projects has been the upgrade of instrumentation on the Rigidex polyethylene production unit.

The polyethylene reactor at the heart of the Rigidex unit is of a pipe loop design, about 18 inches in diameter and 80 feet tall. A mix of isobutane, ethylene and unique catalysts is pumped round the reactor at elevated pressure. The end result is a suspension of polyethylene powder in the isobutane. However if the proportion of solids in the mix becomes too high the reactor contents could agglomerate, resulting in considerable downtime and lost production while the reactor is opened and the material cut out. Control of the solids concentration in the reactor is fundamental to optimising the process. Previous attempts had been made to measure the density of the reactor contents for process control purposes. The measurements however had not been reliable and manual control had been retained.

On reviewing the problem, ABLE recommended an Ohmart Nuclear Density Gauge. This would make measurements over the desired range and accuracy. In addition it was also totally non invasive, thus avoiding any problems associated with the temperature or pressure of the reactor, or coming into contact with the reaction products themselves. Initially there was some concern from BP as the current (and problematic) gauges currently in place were already of a nucleonic design.

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Norrie Wardlaw, Plant I/E engineer



Nucleonic density gauge on reactor



Catalyst hopper level gauges

However, exploration of the technical inadequacies of the existing units and a demonstration of a working system identical to that which we were proposing gave the confidence to go ahead. In all, four clamp-on nuclear density gauges were fitted. Each used a high sensitivity scintillation style detector in order to minimise the level of radiation required for successful measurement. From the experience gained from previous installations, the gauges were able to be supplied precalibrated. In addition, because of the level of training of ABLE commissioning engineers, a full radiation assessment survey was able to be carried out at start-up.

Norrie Wardlaw, the Plant I/E engineer, comments *"We are very pleased with the gauges. They have been giving us reliable density readings ever since they were installed. This information allows us to run as close as possible to the maximum reactor throughput"*.

Meanwhile, on another part of the Rigidex unit, ABLE engineers have been at work replacing further nucleonic devices from other vendors with Ohmart equipment. This time on the Catalyst Hoppers which feed catalyst into the reaction process. The catalyst is stored in cone bottomed hoppers as a slurry in isobutane liquid. The purpose of the measurement is to detect when the hopper is nearly empty of catalyst. This time, multi-tube Geiger Mueller detectors were implemented to enable the detection of the catalyst/isobutane interface whilst still using the minimum of radioactivity.

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