Application Note

INGOLD
Leading Process Analytics

Protection From Gas Explosion

Inertization During Centrifugation

One of the top-ten DMT producers was faced with periodic deficiencies of their oxygen measurement system for centrifuge inertization processes. The use of a competitive METTLER TOLEDO solution could improve efficiency.

Background

DMT is a primary ingredient used in the manufacture of polyesters and industrial plastics. It is used in automotive parts, films, fishing lines, and food packaging materials. The production of high-purity DMT requires accurate recrystallization processes.

At the same stage, DMT is dissolved in methanol. Centrifuges play a key role in separating DMT from methanol to obtain the purified DMT crystals. Safety and efficiency must always be a top priority in the separation process. Under the wrong conditions, centrifuges can turn into an ignition source and consequently become a risk factor.

An inert nitrogen gas atmosphere serves to reduce a centrifuge's oxygen concentration below the Limiting Oxygen Concentration (LOC).

Oxygen measurement requirements

During the separation of DMT from methanol, entry of oxygen into the centrifuge has to be inhibited. If it comes to an oxygen concentration level greater than 11 %, then persons and equipment are dangerously exposed to a potential explosion. The risk of ingress of oxygen is particularly high since phase separation is carried out at a negative pressure of

METTLER TOLEDO

0.8 bar. Through a controlled feed of nitrogen, the oxygen concentration should be limited to remain below a 5 % limit level. The temperature during the separation process is held at approximately 55 °C.

How was the application originally handled

Originally, this application was process-controlled by measuring system pressure and nitrogen flow. Additionally, an expensive multi-channel paramagnetic oxygen system was used to monitor the oxygen concentration at a negative pressure of 0.8 bar of six centrifuges successively. This multi-channel system allowed just one measurement at a time. Five centrifuges were outside control while one was being measured. A costly sampling system was required to ensure reliable measurements. In certain cases methanol could not be retained by the sampling system and was able to cause damage to the paramagnetic oxygen system. Such shortcomings resulted in costly repairs and major process downtimes for all centrifuges.

Use of a METTLER TOLEDO test system

Due to those negative experiences with the existing installation, the client decided to test the METTLER TOLEDO oxygen measurement system consisting of an oxygen sensor InPro 6800 G, retractable housing InTrac 777 e, and oxygen transmitter M 700. In an initial step, the test system was set up in parallel to the installation already in place. In this instance however, conditioning of the measurement gas has become redundant and the sensor was built directly into the headspace of the centrifuge. The diagram illustrates the arrangement.

Customer's benefits

Within the test period of three months, good practical experience was gained with the features of the new system. The comparison of both systems showed excellent measurement correlation. A more detailed analysis of the measurement values resulted into two more advantages of the METTLER TOLEDO solution. Firstly, due to the fact that the measurement is directly built in, the response time and the absolute accuracy of the measurement could be improved. Secondly, long gas sampling tubing increases the possibility of oxygen diffusions, which results in higher reading compared to actual ones. The client defined a two-week maintenance and calibration cycle for the oxygen sensor InPro 6800 G. By employing the retractable housing InTrac 777 e, the separation process did not need to be interrupted during maintenance work. Continuous production was guaranteed.

Decision for METTLER TOLEDO

On the basis of the positive findings surrounding the use of the METTLER TOLEDO system and in particular the fact that it does not need a costly gas sampling system, a total of 6 centrifuges were subsequently equipped with this new system.

METTLER TOLEDO Solution

InPro 6800 G oxgen gas sensor:
- Easy maintenance within two minutes
- Approved for use in hazardous areas
- ATEX II 1/2G EEX ia IIC T6/T5/T4
- FM IS, CIass 1, Div 1, Group A,B,C,D
- Rugged IP68 rated VarioPin (VP) connector

InTrac 777 e retractable housing:
- Ability to retract sensor during continous process operation
- Supports easy maintenance of oxygen sensor
- Approved for use in hazardous areas
- ATEX II 1/2G Ex ia IIC T6/T5/T4

M700 XC oxygen transmitter
- Easy installation and operation
- Simultaneous monitoring of oxygen and temperature
- Redundant measurements with one transmitter
- Approved for use in hazardous areas
- ATEX II 2 (1) G EEx ib [ia] IIC T4
- FM IS, CIass 1, Div 1, Group A,B,C,D

For more information:
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