Air Separation Plant and Bottling Process Gas Analyzer

Basics and background

A typical air separation plant separates atmospheric air into its primary gaseous components: mainly nitrogen (N_2) and oxygen (O_2), and sometimes argon (Ar). Some plants provide further separation to include additional gases such as neon, krypton and/or xenon. Other gas components of air, such as water vapor, carbon dioxide (CO_2) and hydrocarbons are contaminants. They need to be removed to ensure pure products and achieve safety and efficient plant operation. Another issue is cost saving and achieving final quality in the initial stages as well as control of gas purity at bottling step.

Tasks and objectives

There are 3 or 4 basic processes to achieve the separation of air into its pure components:

- Cryogenic distillation process
- Membrane separation
- Pressure Swing Absorption (PSA)
- Vacuum Pressure Swing Absorption (VPSA)

Due to cost aspects and additional further purification steps a combination of these processes is used. A goal can be to achieve gas purity in the initial air separation stages – prior to the second step of gas bottling.

The first step of an air separation plant is traditionally cryogenic fractionation of air into its pure components. Depending on product gas type, purity level and the variation of plant designs, air separation units operate with refrigeration, repeated compression, cooling and expansion, and then liquid fractionation by selective distilling.

Solutions – Use of process gas analyzers

The air separation process can produce high purity gases, but costs are primarily related to energy costs. These costs can be lowered if certain process variables are observed. Process gas analyzers can be used throughout these processes to monitor efficiency and end product quality, in particular gas purity. For traces of CO_2, C_nH_m, moisture and O_2 special trace analyzers are available.

The measurement of percent oxygen with the CONTHOS 3 - PMD is important in different sample points:

- Low pressure column feed
- Crude argon column feed
- Crude argon column product
- Oxygen product stream

Thermal conductivity measurement with the CONTHOS 3 - TCD can be used for following measurements:

- Argon in Crude Argon Column Feed & Product
- H_2 after Oxygen Removal Unit

The CONTHOS 3 – TCD is also applicable for other noble gases such as neon, krypton and xenon.

Conclusions

The combination of NDIR gas analyzers for CO_2 and special sensors for traces of H_2O, O_2 and hydrocarbons in combination with the CONTHOS 3 – TCD/PMD for H_2, He, Xe and O_2 helps to optimize air separation and gas bottling plants in respect to production control, energy efficiency and gas purity analysis.

LFE Process Analytical Instrumentation
Am Germanenring 54
D-63486 Bruchköbel / Germany
Tel.: +49 6181-495302 | Fax: +49 6181-493807
www.LFE.de

The contents of this publication are intended for informational purposes only, and while every effort has been made to ensure their accuracy, they are not to be construed as warranties or guarantees, express or implied, regarding the products or services described herein or their use or applicability. We reserve the right to modify or improve the specifications of our products at any time without notice.

© LFE GmbH & Co. KG