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Quality Control Solution with Certification Module for Truck Filling at Air Separation Plants

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Pure gases are an essential part for the food and beverage sector, medical applications and industrial use in general.

In the food and beverage industry nitrogen is used , e.g., for freezing and chilling and during the packaging of products. Oxygen and Nitrogen play an important role in the medical sector. With these gases artificial respiration, anesthetization as well as the operation and calibration of measurement equipment is possible.

There is a high demand for pure oxygen, nitrogen, argon and other noble gases in the industrial sector.

Air separation plants produce the industrial gases nitrogen, oxygen and argon using air as a cost effective raw material.

There are two types of analytical requirements in an air separation unit: process analytics and truck filling analytics.

Process gas analysis is used throughout the process streams to provide continuous and reliable process control and to verify the final products to comply with the given specifications.

Truck Filling analytics is the analysis of the tank truck content treated as a closed system to issue certificates for the customer.

Siemens Process Analytics is well established in the field of process gas analysis. It offers continuous analytical techniques for evaluating and monitoring the purity and the composition of the gases produced in an air separation unit.

All relevant gas contaminants in oxygen, nitrogen and argon can be easily detected within a ppm range by using the analyzers ULTRAMAT 6, OXYMAT 6, FIDAMAT 6 and OXYMAT 64. From the combination of Siemens gas analyzers, the DAUSCH Technologies AIRMASTER 300 and the detailed experience in systems building, emerges a complete modular package for the truck filling analytics in air separation units that is capable to evaluate and to certify the delivered gas.

Process Analytics

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Truck Filling Analytics

Gas manufacturers are not only aiming to produce a high quality end product but also to meet all the respective rules and laws as well as internal and industry-sector-specific requirements. Furthermore, a customer expects the documentation and certification of the delivered product quality. Therefore, gas analysis integrated at the output of the production unit is required.

Gas is supplied to the different industries in a variety of ways. One of them is the transport of liquid gas in a tank truck. Before the truck leaves the air separation unit it passes through the filling station. There the filling analysis takes place using a tank truck sample point. In the operating room a certificate is issued which is then supplied to the customer.

Gas Analysis

Siemens is a leading producer of process gas analyzers which offers a wide range of analyzers to various industries including the demanding air separation segment. In this case the gas analyzers are used to verify the delivered end product quality.

The gas analyzers ULTRAMAT 6, OXYMAT 6, FIDAMAT 6 and OXYMAT 64 installed in a cabinet with a sample conditioning system are used to determine and monitor the gas composition. The gases of interest are summarized in table 1.

Measurements of oxygen

Oxygen must typically be measured in two concentration ranges: oxygen in high percentages or at trace concentrations.

High percent oxygen measuring ranges are required to ensure the purity of the oxygen produced. The OXYMAT 6 is most suitable for these measurements as it uses a reference gas with selectable oxygen concentration. Using a reference gas concentration of , e.g.,100 % allows configuration of a very small measuring range (99 to 100 %) resulting in extremely high accuracy and stability of the measured data.

Low ppm oxygen measuring ranges (0 to 10 ppm) are required for verifying the product quality of both nitrogen and argon end products where oxygen is an unwanted impurity. The OXYMAT 64 trace oxygen analyzer based on ZrO_2 technology is especially designed to determine trace levels of oxygen in pure gases as it is required in air separation.

Measurement of carbon oxides

The end product must be monitored for traces of CO and CO_2 to assure product quality and compliance with the specification. The well proven ULTRAMAT 6 gas analyzer, which simultaneously measures up to 4 infrared sensitive components in a single unit, is the ideal choice for this application.

Measurement of Hydrocarbons

The FIDAMAT 6 is used to determine traces of total hydrocarbons in the pure gases. Hydrocarbons must be measured to ensure compliance with the product specification set by the consumer.

No.	Measuring component	Background gas	Analyzer	Measuring range	Minimum detection limit
1	% O_2	O_2: 99.95 %	OXYMAT 6	99 ... 100 %	0.05 %
2	CO and CO_2	N_2: 99.999 % O_2: 99.95 %	ULTRAMAT 6	0 ... 10 ppm CO 0 ... 10 ppm CO_2	0.5 ppm (v)
3	C_nH_m	N_2: 99.999 % O_2: 99.95 % Ar: 99.95 %	FIDAMAT 6	0 ... 10 ppm	0.1 ppm (v)
4	ppm O_2	N_2: 99.999 % Ar: 99.95 %	OXYMAT 64	0 ... 10 ppm	0.5 ppm (v)
5	N_2	Ar: 99.95 %		0 ... 10 ppm	0.1 ppm
6	Relative humidity	N_2: 99.999 % O_2: 99.95 % Ar: 99.95 %		-100 ... +20 °C dew point	+/- 2 °C dew point

Table 1: Measured gas components: No. 1: Purity measurement of oxygen, No. 2-5: Trace measurements of impurities in pure gases (oxygen, nitrogen and argon), No. 6: relative humidity measurements

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AIRMASTER 300

The combination of Siemens gas analyzers and DAUSCH Technologies AIRMASTER 300 delivers a complete system for online certification and process monitoring of gases for the food and beverage industry as well as for medical and technical gases, which is applied in the field of filling. By using this process analysis system all relevant gas contaminations in oxygen, nitrogen and argon can be detected within a ppm range.

AIRMASTER 300 can be integrated either as a stand-alone system with its own flexible certification-module or alternatively as a slave system into all superior filling IT-systems.

It consists of five modules, (detailed description on next page) which can be selected according to the specific requirements of the client and are then integrated into the production unit.

AIRMASTER 300 is available as shelter (see fig. 1) or cabinet version (if an analysis room is available).

From the different modules results an individual package which matches the customer specifications. The module concept enables the seamless integration of this innovative process analysis technology into existing production processes.

When not used for certification, the system can be employed for process monitoring by sampling the tanks in the air separation unit.

With the AIRMASTER 300 system, certification can be issued

- according to DIN EN 10204 (inspection certificate 3.1 and 3.2)
- according to IGV
- according to ISBT / EIGA
- according to customer specifications
- according to the regulations for medical oxygen

Siemens Process Analytics and DAUSCH Technologies offer a complete solution with improved safety thanks to the high accuracy of the analyzers and the certified purity of the tank loads.

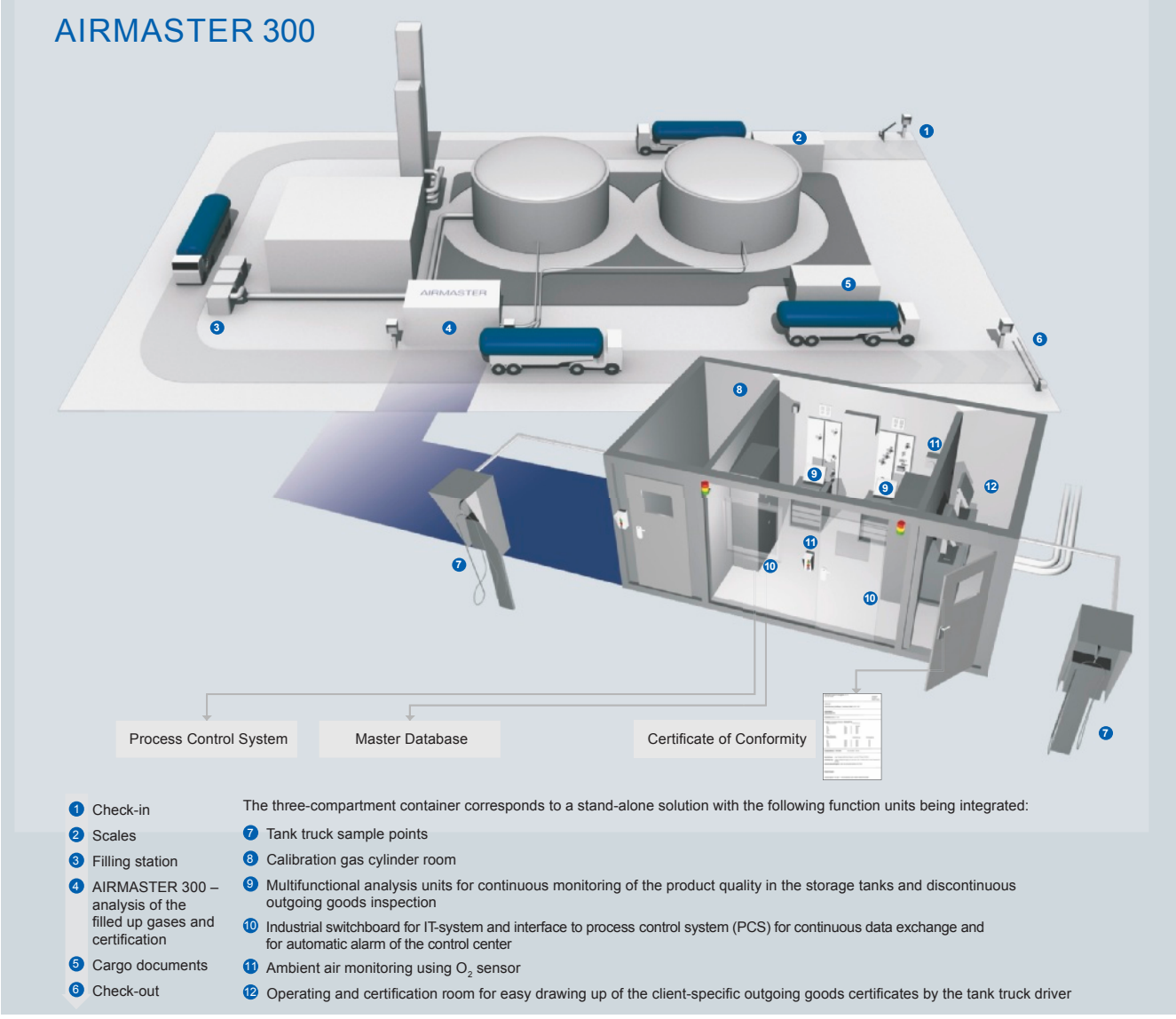

Figure 1: AIRMASTER 300

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System-Module

Module 1: Analyzer concept
- Siemens gas analyzers: ULTRAMAT 6, OXYMAT 6, FIDAMAT 6 and OXYMAT 64

Module 2: Information technology
- Server software (continuous further development)
- Relational SQL-compatible database
- Remote control by means of VPN remote service interface
- Process reliable PLC for communication with field level devices
- Ethernet technology
- Interfaces for process control system

Module 3: Certificates
- Terminal system for easy data input by tank truck driver
- Printout of certificates of conformity, agent and medicinal product certificates

Module 4: System integration
- Air-conditioned multiple compartment shelter
- Industrial cabinets

Module 5: Sample conditioning
- Sampling conductors to the process
- Specifically developed weatherproof tank truck sample points
- Sample conditioning

Figure 2: User panel

Key features and benefits

Flexible solution
- Can be integrated into any filling and production process
- Can be integrated into existing IT-infrastructure (stand-alone or slave-system)
- Modifiable detection analysis for various components and applications (agent analysis, analysis of prefabricated pharmaceuticals, ...)

High process safety
- High measurement accuracy, certification of the tank content
- Easy handling and calibration
- Low detection limits; high stability
- Specifications for gases in the food and beverage industry as well as for technical and medical gases possible
- Extensive service and support concept

Future-proof software concept
- Platform independent
- Open database design and applying standards
- Individual VPN-connection

Traceable documentation
- Client-specific and statutory certificate contents
- Client-specific certificate template for printouts
- Constant data replication with master database (also across locations)

Additional information:

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