Jouni Ilvonen, AGA, subsidiary of Linde Gases, Finland, provides details on the largest speciality gas supply system commissioned in Finland.

Neste Oil Corporation has commissioned a new 5200 m^2 research and technology facility at its refinery in Porvoo, Finland, equipped with a speciality gases supply system supplied by AGA, the Scandinavian subsidiary of Linde Gases.

The speciality gases supply system at Neste Oil is the largest of its kind within the petrochemical industry in Finland and one of the largest in northern Europe. It took more than 3000 manhours to complete the project and the installation has become a key reference site for similar projects in the Nordic region. It is Linde's second gas supply system installation for Neste Oil, having previously implemented a smaller version at the company's laboratory at the Naantali refinery.

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Background

The Parvoo is a renewable diesel plant with a production capacity of 190 000 tpy. It was brought online in 2007 to produce NExBTL diesel, a hydrotreated vegetable oil, not the traditional transesterified biodiesel. It produces 6.8% of the diesel consumption in Finland (2.5 million t). Another plant of the same capacity started in 2009 and two world scale units, with a capacity of 800 000 tpy each, are being built in Singapore and Rotterdam.

Planning of the new research and technology facility began in 2008 to replace an existing laboratory facility built by Neste Oil some decades ago. With the promulgation of increasingly more stringent safety legislation, the existing laboratory was found to be located too close to the refinery to meet enhanced contemporary safety regulations. The recently commissioned facility has been constructed in a new location on the Porvoo site, designed to support Neste Oil's focus on lower emission traffic fuels, as well as its continuous development of clean fuels and advanced petroleum products to meet future environmental requirements.

The quality control laboratory, housed in the new facility, is manned by 50 personnel, half of whom are working around the clock to verify the integrity of process materials from the raw material phase to the finished product. With the additional space afforded by the larger facility, this number is likely to increase to approximately 75 people. The company's research and technology unit is also housed in the new building, comprising approximately 250 personnel.

The role of gases in quality control assessment

The central gas system, incorporating a corrosion proof stainless steel gas pipe network of more than 4.5 km, transports multiple process gases piped directly into the refinery by Linde. The implementation includes Linde REDLINE® points of use, cylinder regulators and gas panels from its speciality gases equipment product range, ensuring highly stable gas outlet pressure and reliable transmission of high quality pure gases and gas mixtures from the source to the point of use.

Linde is supplying Neste with multiple process gases. Nitrogen used by the new laboratory is stored in its liquid phase because of the high volumes needed by the facility and it is evaporated before use as a detector gas in gas chromatography. Argon is used for inductively coupled plasma mass spectrometry and carbon dioxide is used both in its liquid phase, for cooling, and in its gas phase as an inert gas and a safety gas in fire

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extinguishers. Hydrogen is used as both a detector gas and carrier in gas chromatography, and helium is also used as a carrier gas for this application. Compressed air and synthetic air provide high pressure for certain equipment and liquid petroleum gas (LPG) is used for flashpoint tests and for burning out samples using Bunsen burners.

Chromatography

Chromatography is the process of separating a mixture into individual components. Through the separation process, each component in the sample can be identified (qualitatively) and measured (quantitatively). Gas chromatography (GC) is used to analyse compounds that are thermally stable and volatile (or can be made volatile). Because of its simplicity, sensitivity and effectiveness in separating components, GC is one of the most important tools in the analytical arena.

In GC, the carrier gas plays an important role in transporting the sample through the instrument's column and into the detector. The carrier gas must be inert, or at least must not react with the stationary phase in the column. Helium, nitrogen, argon and hydrogen are commonly used as carrier gases. The choice depends on the type of detector, column, application and safety requirements. The choice of the carrier gas is also dependent on requirements in terms of separation efficiency and speed. Hydrogen has the lowest viscosity of all gases and therefore provides the highest mobile phase velocity and the shortest analysis time. Helium, on the other hand, gives the best overall performance and peak resolutions for many applications, making it an optimum choice of carrier gas in those cases.

The purity of the carrier gas is another important factor. Impurities, especially hydrocarbons, cause base line noise and reduced sensitivity, and might increase detection limits. Traces of water and oxygen may also decompose the stationary phase, which leads to premature destruction of the column.

Detectors need different auxiliary gases to run, depending on their detection processes. Linde offers a wide range of high purity carrier and detector gases. For process control applications, high quality instrument gases, such as instrument argon, instrument helium, instrument hydrogen and instrument nitrogen, are commonly used for analysis. For quality control and research and development analysis, the higher quality detector gases will be appropriate and for special detectors, such as electron capture detectors, individually certified ultra high purity gases are available. For simplified and cost effective operation, moisture traps and other purifiers are not necessary when the recommended grades of high purity gases, the appropriate gas supply equipment and purging techniques are being used.

Laboratory safety

The new laboratory facility incorporates several high tech safety features, including gas and hydrocarbon sensors, which alert personnel to leaks, and a system that allows gas lines to be shut off instantaneously in an emergency. For safety reasons, hydrogen is piped into the laboratory from an outside storage area.

Beyond safety, the commissioning of the building will lead to productivity improvements across the board as a result of the new and upgraded equipment that has been installed. With the technology and quality control personnel housed in the same building, the time taken to receive the analysis of certain samples will be greatly reduced. The latest technology in gas tanks provides improved line pressure, while Linde's remote monitoring of gas levels will ensure that Neste's supply is uninterrupted. HE