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Air Liquide Engineering

designs, develops and builds gas production units for the Group or for its customers. It comprises 3,200 employees, spread over ten Engineering & Construction centres, covering its major markets. In 2007, it has integrated the **teams of Lurgi**, a leading technology company operating worldwide in the fields of process engineering and unit contracting for the refining and petrochemicals markets.

Second generation biofuels

Unlike first generation biofuels, which process the noble part of the plants, second generation biofuels do not compete with food chain needs, since they only use residues from agricultural or forestry production. These biofuels, which are very pure and sulfur free, offer not just excellent engine fueling characteristics; they also generate **fewer CO₂ emissions** compared to conventional fuel, thereby contributing to the fight against climate change.

France: launch of a second generation biofuel project*press release*

In light of the growing scarcity of oil resources, biofuels constitute an alternative solution, since they can serve as a **complement to fossil fuels**. As part of its policy aimed at reducing greenhouse gas emissions, the European Union is requiring that renewable energy sources be increased to 10% of global fuel volume by 2020. Unlike first generation biofuels, the production of **second generation biofuels** uses only the non-edible part of the plant.

The French Atomic Energy Commission (CEA) is launching the first phase of a project to build a **biomass conversion pilot unit** that will transform agricultural and forestry residues **into second generation biofuel**, in Bure Saudron, which is located 80 km from Nancy in northeastern France. The CNIM group (Constructions Industrielles de la Méditerranée) will be the project's general contractor. Air Liquide, a partner on this project, will be supplying **key technologies needed to transform synthesis gas into biofuel**.

Air Liquide Engineering and Construction teams (notably through its subsidiary **Lurgi**) are responsible for coordinating **some of the technical engineering operations and process steps downstream, from gasification through final biofuel upgrading**. **Air Liquide** will also provide **oxygen and hydrogen**. Oxygen is a required component of the gasification process, and hydrogen is used to enhance the quantity and quality of the synthetic fuel produced.

The demonstration unit, which combines in a single facility all of the various **second generation biofuel** production elements, will be the **first production unit of this kind in France**.

François Darchis, Senior Vice-President Air Liquide Group, in charge of R&D, Advanced Technologies and Engineering & Construction, declared: **"We are delighted to have been entrusted by the CEA and the CNIM group to provide the technological expertise for this demonstration project based in France, which represents a significant step forward in the development of biofuels. This project is in line with the Group's approach to sustainable development. Energy and the Environment are two growth drivers for the Group."**

The biofuel production process

Biomass such as forestry and agricultural residues, is pretreated to reduce moisture and particle size. It is then converted into synthesis gas using a gasification reactor, a process that begins with a reaction of combustion under high pressure and high temperatures above 1300°C through the addition of oxygen and steam. The next step involves removing CO₂ and impurities such as sulfur from the synthesis gas.

The pure synthesis gas that results is then converted using the **Fischer-Tropsch technology** developed by the partners Statoil, PetroSA and Lurgi.

The result of this last phase is a green wax that will subsequently be upgraded during the final downstream process, resulting in a synthesis fuel of high purity and high energy efficiency.

Air Liquide is the world leader in gases for industry, health and the environment, and is present in over **75 countries** with **43,000 employees**. Oxygen, nitrogen, hydrogen and rare gases have been at the core of Air Liquide's activities since its creation in 1902. Using these molecules, Air Liquide continuously reinvents its business, anticipating the needs of current and future markets. The Group innovates to enable progress, to achieve dynamic growth and a consistent performance.

Innovative technologies that curb polluting emissions, lower industry's energy use, recover and reuse natural resources or develop the energies of tomorrow, such as hydrogen, biofuels or photovoltaic energy... Oxygen for hospitals, homecare, fighting nosocomial infections... Air Liquide combines many products and technologies to develop valuable applications and services not only for its customers but also for society.

A partner for the long term, Air Liquide relies on employee commitment, customer trust and shareholder support to pursue its vision of sustainable, competitive growth. The **diversity** of Air Liquide's teams, businesses, markets and geographic presence provides a solid and sustainable base for its development and strengthens its ability to push back its own limits, conquer new territories and build its future.

Air Liquide explores the best that air can offer to preserve life, staying true to its sustainable development approach. In 2008, the Group's revenues amounted to **€13.1 billion**, of which almost 80% were earned outside France. Air Liquide is listed on the Paris Euronext stock exchange (compartment A) and is a member of the CAC 40 and Dow Jones Euro Stoxx 50 indexes.