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Carbon capture

developing a sustainable business model

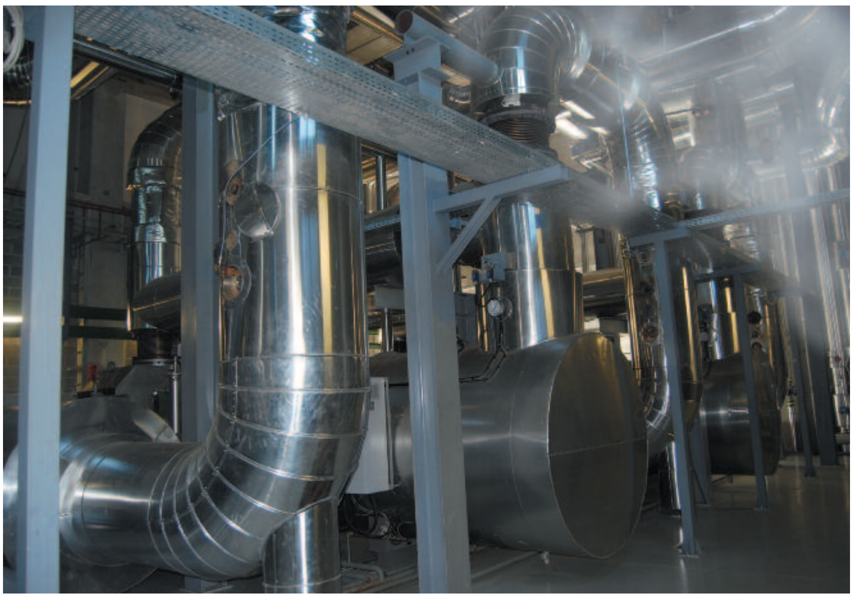
Union Engineering is constantly improving the technology for the capture of carbon dioxide from flue gasses.

The rise in awareness of global warming has created heightened consumer, regulatory, and industry interest in clean forms of energy generation. Specifically, the impact on the natural environment from the burning of fossil fuels has brought increased attention to technologies that capture carbon dioxide from flue gas.

A number of projects are in development around the world that aim to utilise more energy efficient absorption processes for the capturing of carbon dioxide from flue gases. These pilot projects are for very large scale carbon capture and storage applications. However, for smaller scale carbon capture applications, Union Engineering already has developed and supplied fully proven and commercialised technologies and is constantly improving this technology for the capture of carbon dioxide from flue gases. The technology can be used in a number of applications where the benefits are truly clean-tech, meaning that the technology will improve operational performance, productivity, and efficiency while reducing costs, inputs, energy consumption, waste, and pollution.

The capturing process

With capture plants from Union Engineering, carbon dioxide can be captured from any gas stream based on the combustion of fossil fuels, including but not limited to coal, heavy fuel oil-fired steam boilers, and natural gas-fired combustion engines. Moreover, the technology can be used to capture carbon dioxide from non-



With a well-integrated on-site utility setup, any beverage manufacturer has greater control of critical utility supplies, including carbon dioxide supply.

The heart of this unique CO2 Plant technology consists of 3 basic elements; absorber, stripper and reclaimer. The interaction between the 3 units optimises the plant performance, and offers the most innovative and environmental friendly solution, for on-site CO2 production.

power generation sources, like lime kilns. The capture plants from Union Engineering are based on the most well-proven absorption technology currently available on the market, namely high concentrated monoethanolamine (MEA). MEA is a primary amine that reacts readily with carbon dioxide. Since the reaction is purely chemical absorption it works well with gas streams having low partial CO2 pressure, as is the case for flue gases.

The actual absorption of the carbon dioxide takes place in an amine absorption unit. Before entering the absorption unit the gas is purged of sulphur oxides, nitrous oxides, and suspended particles as these inhibit the performance of the absorption unit. In the absorption unit carbon dioxide reacts with the MEA solution in an absorption tower. Any residual gas that does not react with the MEA solution is exhausted through the top of the tower.

Once the carbon dioxide is captured in the MEA solution it is transferred to a stripping system. Here it is again released from the MEA solution by increasing the temperature of the solution to a point where the chemical reaction that took place in the absorber is reversed. Having started as a gas with a low concentration of carbon dioxide (depending on the type of fuel used the CO2 will be in the range of 5% to 12%), the gas being released from the stripper is a highly concentrated stream containing roughly 99% pure carbon dioxide. This stream can either be used directly in gaseous form or be further purified and liquefied to meet the strictest requirements for food and beverage grade carbon dioxide in accordance with specifications from regulators like the International Society of Beverage Technologists (ISBT).

Depending on the design of the absorption unit the plant can recover up to 95% of the carbon dioxide found in the incoming flue gas. In addition to reducing carbon dioxide emission into the environment and turning the flue gas into a sellable product, the mandatory pretreatment of the gas can include the catalytic reduction of nitrous oxides and the removal of sulphur oxide and particles by wet scrubbers.

Using carbon capture for on-site supply of beverage CO2

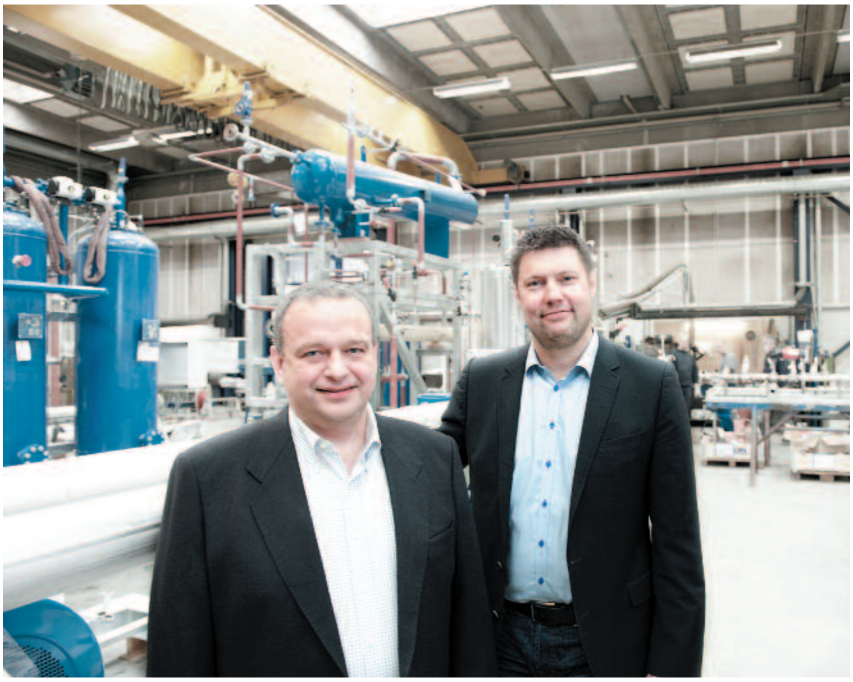
Since carbon dioxide is a volatile product it can only be transported over relatively short distances. The cost associated with the transport of carbon dioxide is often a significant part of the delivered cost to the end-user. Being able to produce high purity carbon dioxide on-site, therefore, can offer significant cost reductions.

An example of an industry where on-site production of carbon dioxide offers great benefits is the carbonated beverage industry.

As in other energy intensive industries, bottling plants often establish their own utility supply systems so as to avoid the hassles from power cuts and other supply constraints. In many bottling plants around the world, these utility systems are not integrated. A typical beverage producer has a boiler for generating steam, hot and chilled water as well as a facility for power generation based on either combustion engines or turbines. CO2 to the bottling line comes either from an on-site CO2 generating plant that combusts fossil fuel only for the single purpose of producing CO2 or, it is obtained from an industrial gas company that delivers carbon dioxide to the bottling plant by truck. These multiple utility systems each have associated costs that drive up the total cost of production and create an unnecessary large carbon footprint. Therefore integrating these independent utility systems can bring significant benefits to the bottling plant.

Utility generation

One approach to have more utilities generated by an integrated system is to base on-site power generation on combustion engines. In addition to the direct generation of electricity, adding waste heat recovery boilers and absorption chillers to the system, also steam, hot and chilled water can be generated from the fuel fired into the engine.



CEO Peter Kriklywi and CSO Michael Mortensen in the production at the headquarters of Union Engineering in Denmark. Other facilities are located in Brazil, China, Singapore and the US – and later in 2011, Dubai.

By adding a Union Engineering CO2 capture plant to the system, beverage grade CO2 can be produced on-site by capturing the CO2 in the flue gases. Again waste energy from the power generation will be used for the CO2 capture process, thereby bringing the overall efficiency of the fuel used for the main power generation to a very high level.

With a well-integrated on-site utility setup, a beverage manufacturer has greater control of critical utility supplies. On-site CO2 generation gives ultimate control of a very critical bottling parameter, namely the quality of the final liquefied carbon dioxide. And not without value to the beverage producer is the significant lower carbon foot print achieved by better integration of its utility system.

Union Engineering, headquartered in Fredericia, Denmark, is a designer and manufacturer of high-quality CO2 processing plants. The company has subsidiaries in Brazil, China, Singapore and the US. ■

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