Fact sheet

SHELL CANSOLV® CO_2 CAPTURE SYSTEM

A leading post-combustion carbon dioxide (CO_2) removal technology

SHELL CATALYSTS & TECHNOLOGIES
TRANSFORMING ENERGY TOGETHER

AT A GLANCE

CUSTOMER DRIVERS

Legislative constraints (permits, licence to operate); carbon-footprint-limited specifications (restricted market access); corporate sustainability drivers

SOLUTION

Post-combustion CO_2 capture, via retrofit to extend life or as a greenfield solution, from exhaust gases using the CANSOLV CO_2 Capture System

VALUE DELIVERED

Reduction in carbon intensity (CO_2 emissions); added coincidental benefits such as significant reductions in sulphur dioxide (SO_2) and nitrogen dioxide (NO_2) emissions

PROOF POINT

Two CANSOLV licensed plants are in commercial operation, including one of the world's largest post-combustion applications. Several other units are currently in various advanced stages of engineering.

Current and anticipated legislation throughout most of the developed world suggests that a reduction in the amount of CO_2 that industry will be allowed to emit in the future is inevitable. Meanwhile, the world's energy demand is expected to increase by nearly 50% by 2030, and fossil fuels are likely to be a significant portion of the world's energy mix for many years to come.

Over 90% of the CO_2 in exhaust gases can be effectively and economically removed through the implementation of Shell's carbon capture technology. Although several markets for this CO_2 exist, one of the most interesting applications is to use it to create a miscible flood within an ageing or partially depleted oilfield to increase the oil extraction through enhanced oil recovery (EOR). The added value is that the CO_2 remains permanently stored underground, thus aiding the achievementof greenhouse gas abatement targets and enabling access to carbon credits while delivering increased oil production. In post-combustion CO_2 capture, the CO_2 is chemically removed from the flue gas after the combustion of the fossil fuel, so the emission control system is segregated from the production facility, unlike some alternative CO_2 capture technologies. The system is essentially standalone and, therefore, ideal for retrofit scenarios. Shell Catalysts & Technologies has developed a process for post-combustion capture, which it is pioneering on a significant commercial scale.

ABOUT THE TECHNOLOGY

The CANSOLV CO_2 Capture System employs a regenerable solvent. A proprietary amine technology captures the CO_2 from the flue gas and releases it as a pure stream, which is delivered to the client for sale into the EOR and commodity markets or for eventual sequestration.

Shell Catalysts & Technologies has used its experience to develop a patented CO_2 capture technology that offers cutting-edge performance, including low parasitic energy consumption, fast kinetics and extremely low volatility.

BUSINESS VALUE

The technology can help refiners, utilities and other industries to lower their carbon intensity and meet stringent greenhouse gas abatement regulations by removing CO_2 from their exhaust streams, with the added benefit of simultaneously lowering SO_2 and NO_2 emissions. It can also help to enhance margins. For instance, in an application of the integrated CANSOLV SO_2/CO_2 system, bulk removal of CO_2 will be achieved using technology from Shell Catalysts & Technologies, along with nearly complete removal of the SO_2 and significant NO_2 removal. This will enable the client to reduce its CO_2 emissions and sell the removed CO_2 to oil producers for their EOR requirements.

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PROCESS DESCRIPTION

As shown in Figure 1, the key process steps are:

1. Feed gas is quenched and saturated in a circulated water pre-scrubber.
2. Gas contacts the lean amine solution in a counter-current mass-transfer packed absorption column.
3. CO_2 is absorbed and the treated gas exits to atmosphere.
4. Midway through the column, partially loaded amine is removed from the tower, cooled and reintroduced over a layer of mass transfer packing.
5. CO_2-rich amine from the absorption column is pumped through a lean–rich amine heat exchanger and then on to the regeneration column.
6. Rising, low-pressure saturated steam in the column regenerates the lean amine solution. CO_2 is recovered as a pure, water-saturated product.
7. Lean amine is pumped from the stripper reboiler to the absorption column for reuse in capturing CO_2.
8. The CO_2 is directed to by-product management systems.

PERFORMANCE DATA

The technology is highly adaptable to a wide variety of industrial applications and gas flow rates, and CO_2 concentrations from 3.5 to 25%. Licensed units treating gas flow rates from 11,000 to 685,000 Nm^3/h and CO_2 concentrations from 9 to 12.5% are in operation. Systems can be guaranteed for bulk CO_2 removal of over 90%. Moreover, the technology has been designed for reliability through its highly flexible turn-up and turndown capacity.

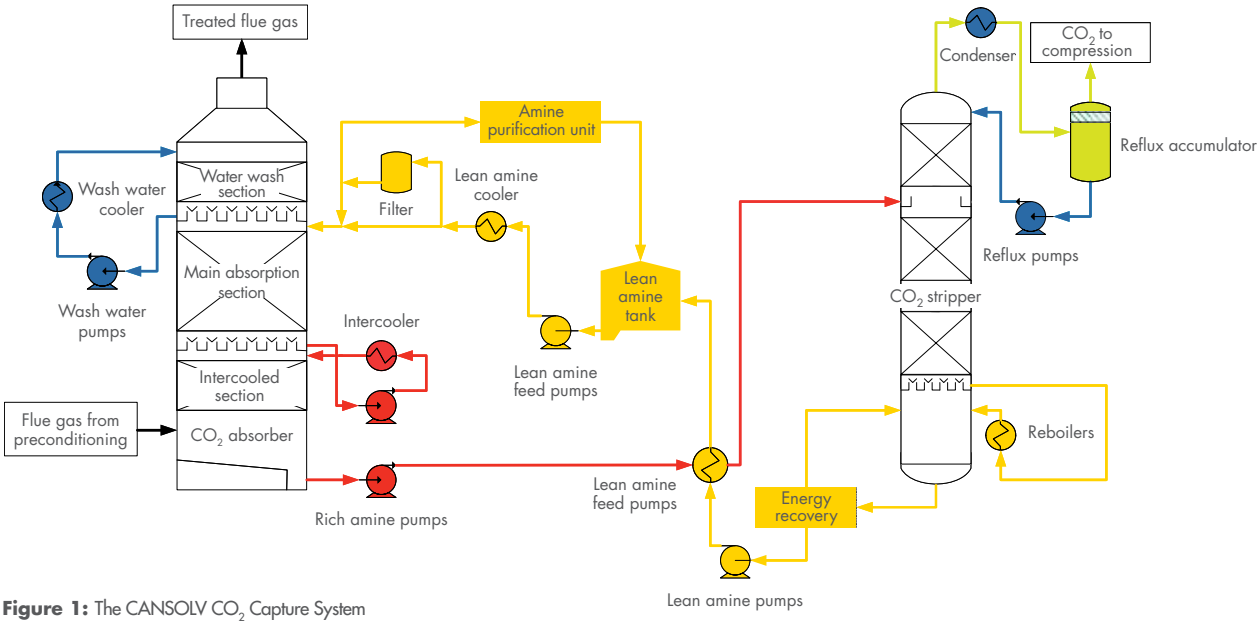

Figure 1: The CANSOLV CO_2 Capture System

For more information, please visit www.shell.com/ct

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