WGCPARIS2015
WORLD GAS CONFERENCE
"GROWING TOGETHER TOWARDS A FRIENDLY PLANET"

26th World Gas Conference | 1-5 June 2015 | Paris, France

Greenhouse Gas Emissions Reduction

by Re-injection and Re-use of CO_2 from Sulphur Recovery Units at RasGas

Abdulla M. Al-Attiyah, Specialist Project Engineering - Venture Development Planning, RasGas Company Ltd, Qatar

Enderson E. Garcia, Head of Facilities Engineering - Venture Development Planning, RasGas Company Ltd, Qatar

Background

The State of Qatar is continually striving to be at the forefront of measures to conduct energy operations with minimum environmental impact. One aspect of these efforts is a collection of projects developed by RasGas associated with the greenhouse gas emissions reduction. These projects will capture, treat, inject and /or re-use Carbon Dioxide (CO_2) rich streams from the existing Sulphur Recovery Units (SRU) at RasGas.

Aim

This collection of projects is an integrated programme that, if implemented, would reduce the atmospheric emissions of CO_2 by up to 2.5 million tons per year at RasGas. It would strive to make maximum use of existing facilities, thereby enabling a potentially cost-effective pursuit of improved environmental performance.

Methods

Existing facilities CO_2 production

The CO_2 is present in the feed gas to the RasGas LNG/Sales gas processing facilities; it is removed together with the Hydrogen Sulphide (H_2S) in the acid gas removal (AGR) section of each process facilities. In RasGas LNG Trains 6 & 7 and sales gas AKG-2 this acid gas is sent to the Acid Gas Enrichment section (AGE) of the Sulphur Recovery Unit (SRU) where H_2S is selectively removed, and sent for its conversion into Sulphur, whereas the not absorbed CO_2 and other Sulphur compounds traces are diverted to the incinerator (Fig. 1).

For RasGas LNG Trains 4 & 5 and sales gas AKG-1, the acid gas is injected in a dedicated acid gas well using the Acid Gas Injection (AGI) centrifugal compressors.

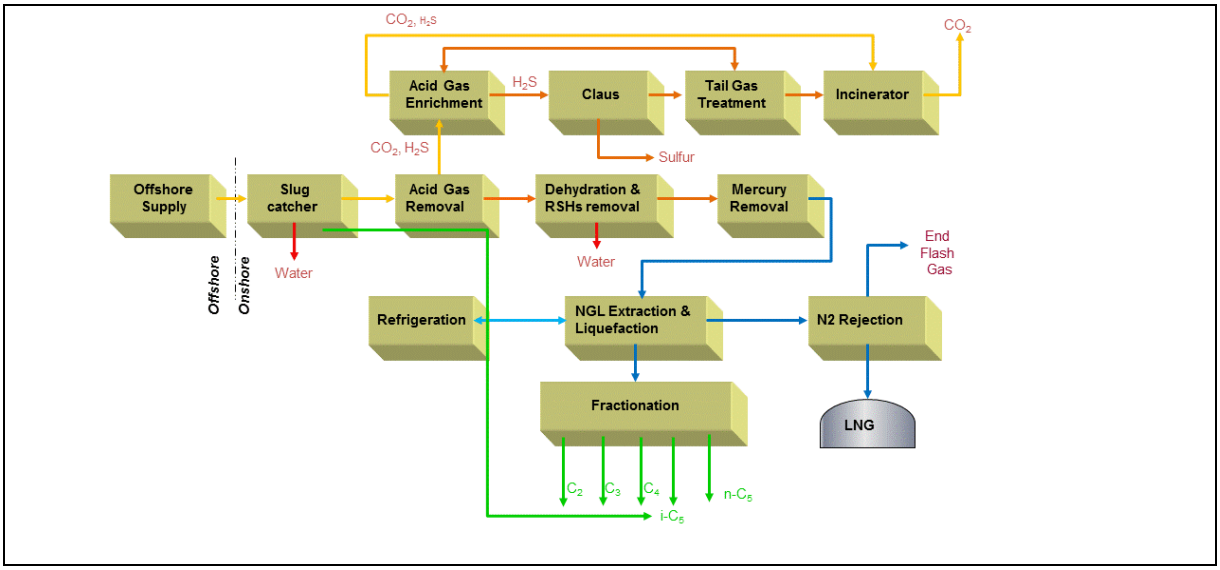

Fig. 1 LNG Process overall block diagram.

Acid Gas Diversion Project

The first project of the collection would install a 40 inch pipeline to interconnect the existing 36 inch acid gas header (Fig. 2), bring Trains 4/5/AKG-1 acid gas to Trains 6/7/AKG-2 SRU's, these SRU's were found to have enough processing capacity to treat the original Trains 6/7/AKG-2 acid gas (approx. 150 KNm^3/h), plus the diverted Trains 4/5/AKG-1 acid gas (approx. 90 KNm^3/h), the total treated acid gas (approx. 240 KNm^3/h), would produce a CO2 rich stream at the overhead of the AGE Absorber of approx. 140 KNm3/h, which equates for approx. 2.5 million tons per year of CO_2. After the implementation of this project the AGI Compressors would become idle.

CO2 injection and export tie-ins Project

The second project would interconnect the AGE absorber overhead of TR-6/7/AKG-2 SRU's via a 40/48 inch pipeline, with the suction of the AGI compressors, these compressors would change their function from Acid Gas (CO_2, H_2S) to mainly CO_2.

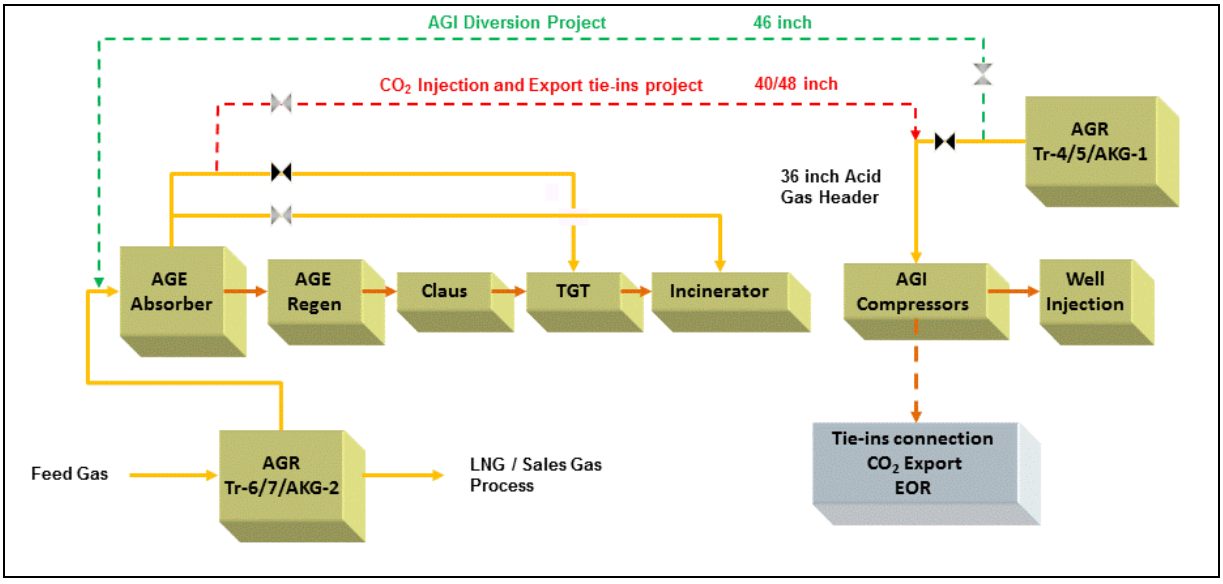

Fig. 2 AGI Diversion and CO_2 injection and export tie-ins project diagram.

The AGI Compressors were studied and found suitable for compressing the CO_2 stream at the required well injection pressure.

The connection tie-ins are proposed to be in the locations shown in Fig. 3

It is envisioned the potential use of the CO_2 outside RasGas fence (E.O.R), for which tie-ins provisions would be taken. Any future CO_2 transportation would require dehydration, for avoiding water condensation and subsequent corrosion on the transport pipeline. Tie-in points for potential future CO_2 dehydration would be carried out between the 3rd and 4th stages of each AGI compressor because it is the lowest water concentration point in the process, and would ensure the smallest possible dehydration unit.

Two additional 12 inch valves for potential future export would be added to the existing 12 inch valve at the 4th stage of the AGI compressors. (Fig. 4)

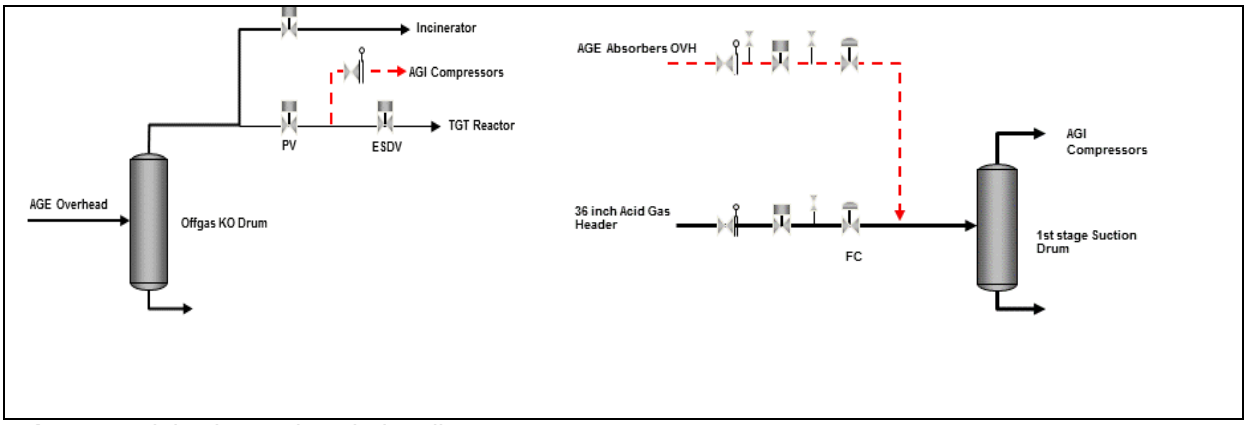

Fig. 3 CO_2 injection project tie-ins diagram.

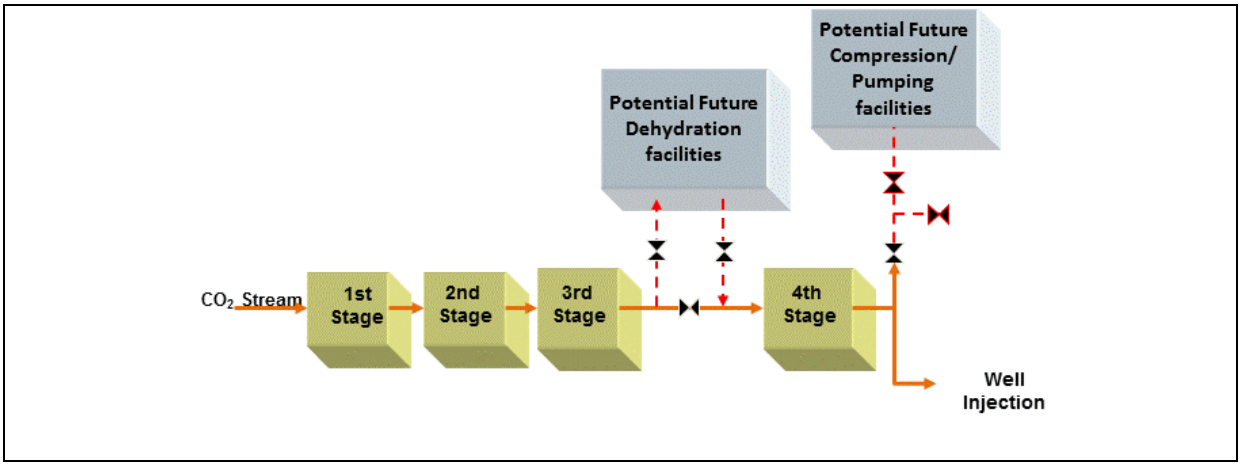

Fig. 4 Potential CO_2 future use tie ins location diagram.

Operations and Maintenance Elements
If implemented these projects would require:

- New Operational procedures covering the AGI Compressors operation when switching from Acid Gas to CO_2 rich stream
- The connection between AGE Overhead and the Incinerator would be maintained as a backup in case of AGI compressor shutdown.
- Operator needs to be aware and trained about the new controls parameters for the AGI compressors, based on the new compressor curves.
- The overall maintenance strategy needs to be updated, based on the new service (CO_2 rich stream vs Acid Gas injection)

Results

At the time of writing, there are no measurable results available.

Conclusions

This collection of projects (Acid Gas Diversion, CO_2 injection and export tie-ins) is an integrated programme that, if implemented, would reduce the atmospheric emissions of CO_2 by up to 2.5 million tons per year at RasGas. It would strive to make maximum use of existing facilities, thereby enabling a potentially cost-effective pursuit of improved environmental performance.