The Science of Sour Gas

Sour gas is natural gas or any other gas containing significant amounts of hydrogen sulphide (H_2S), a colorless flammable compound that has a strong rotten egg odor. This gas is toxic to humans and animals in low concentrations, and can be dangerous if not handled properly. More than 30% of the natural gas produced in Western Canada is considered sour, and sour gas can also occur as solution gas in crude oil. Not only is sour gas toxic, it also places restrictions on the materials that can be used for piping and other equipment handling sour gas, as many metals are sensitive to sulphide stress cracking. The presence of hydrogen sulphide in gas causes lower quality burning and the production of sulphur dioxide, and so is regulated in commercially sold gas.

Before a raw natural gas containing hydrogen sulphide can be used, the raw gas must be treated to remove those impurities to acceptable levels, commonly by an anime gas treating process. The removed H_2S is most often subsequently converted to by-product elemental sulphur in a Claus process. First invented over 100 years ago, the Claus process has becoming the industry standard, recovering elemental sulfur from gaseous hydrogen sulfide. This multi-step process (thermal and catalytic), recovers sulphur from the gaseous hydrogen sulphide found in raw natural gas and from the by-product gases derived from refining crude oil and other industrial processes. The sulphur produced from this process is used for manufacturing sulphuric acid, medicine, cosmetics, fertilizers and rubber products.

Processes within oil refineries or natural gas plants that remove hydrogen sulphide are commonly referred to as sweetening processes because they result in products which no longer have the sour, foul odors of hydrogen sulphide.

Health & Safety

Because so much of Canada's natural gas is sour, Canadian oil and gas companies have become leaders in safe operation of sour gas facilities. Special precautions are taken during drilling critical sour gas wells (wells with the potential for large hydrogen sulphide releases or for any release that might affect population centres). These include specific requirements for drilling plans and procedures, well design, specialized worker training and supervision, safety specialists, detailed emergency response plans and community consultation.

Emergency response planning is another important component of the safety measures performed before and during drilling. Companies and governments have developed computer models to predict how sour gas would disperse in the event of a blowout or accidental release, and emergency response planning is developed according to the results of these models. Also based on these models are plans which specify steps that would be taken to protect public health and safety in such an instance. Steps include igniting the gas, which converts hydrogen sulphide into sulphur dioxide, which disperses more effectively and results in lower ground-level concentrations. Air quality downwind of the well is also closely monitored during a sour gas blowout, often using mobile equipment designed to track the plume of gas and identify concentrations of gas both inside and outside the emergency planning zone. Using these measurements and observations, the emergency response team determines if there is a danger to residents, and if so, they would be evacuated or the well would be ignited to protect the public. Thousands of Canadians are employed in oilfield safety and testing related careers, and each of them uses science in their daily work.

This information has not been verified by Science Alberta Foundation, and is for general informative purposes only.