

Let us speak about sulfur production and storage

To be marketed, sour gas needs to be cleansed of its acid components (H_2S and CO_2). The most common process consists first in upflowing sour gas in a downflowing amine solution which absorbs acid components and releases sweet gas (CH_4). The resultant "rich" amine is routed into a regenerator which separates an H_2S -rich stripped gas from a clean amine that will be recycled. The H_2S -rich stripped gas is then usually routed into a Claus process¹ to produce elemental sulfur. Most sulfur produced worldwide² today is a by-product of sour hydrocarbon (E&P or refineries) processing plants. The world sulfur production is shared as follows: acid gases 49%, crude oil 45% and heavy oils 6%. The main producers are Canada, U.S.A., Middle East, Kazakhstan and Russia. Sulfur is a basic element used to produce sulfuric acid which in turn is widely used in the chemical industry (to produce fertilizer, or to whiten paper pulp) but also in the mining industry (to leach metals such as uranium, nickel, zinc or cobalt).

By contrast to hydrogen sulfide, which is a broad-spectrum poison, sulfur is a harmless and extremely stable product which, in the past, has been stored in the open air³ without any specific precautions being taken. In the Lacq field (south of France) for instance, large amounts of sulfur have been stored in the open air over the past 50 years without any reported health problems in the large urban areas surrounding the field (**Figure 1**).



Figure 1 – Example of conventional open air sulfur storage (Lacq field – South West France)

However, over the last ten years, following environmental pressure from stakeholders including NGO and local communities, legislation in producing countries deals at

¹ The sulphur recovery Claus process includes a thermal stage where H_2S is burnt with air to produce SO_2 and water then a catalytic stage where H_2S activated by aluminium or titanium oxide reacts with SO_2 to produce sulphur. The two stages Claus process follows the global equation : $10 \text{H}_2\text{S} + 5 \text{O}_2 \text{ ---- } 2 \text{H}_2\text{S} + \text{SO}_2 + 7/2 \text{S}_2 + 8 \text{H}_2\text{O}$.

² Mining sulphur extraction only represented in 2010 only 2% of production)

³ Even if any sulfur management plan envisages marketing all produced sulfur, due to factors such as market conditions or the lack of availability of rolling stock, sulfur cannot be continuously exported at the same rate as it is produced, and requires temporary storage.

reducing open air sulfur storage. International Oil Companies have responded by proposing original technologies.

A good example is the Kashagan field where sulfur is liquefied then poured into sealed containers monitored by temperature and H₂S sensors. Prior to sales, the sulfur will be re-melted, not crushed and reformed into solid pastilles to avoid dust (Figure 2).

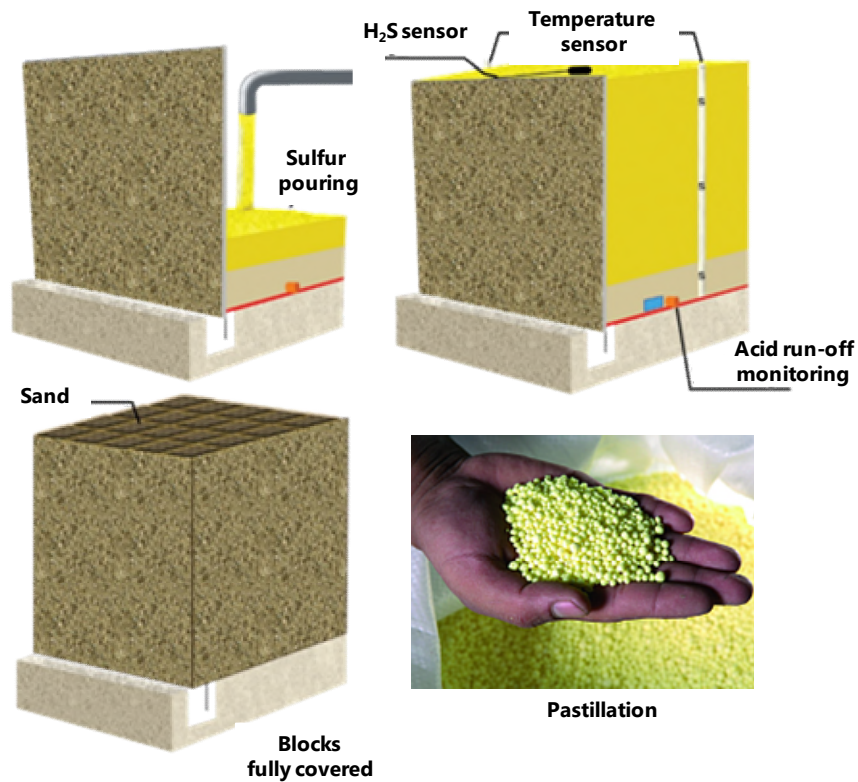


Figure 2 – Kashagan sulfur storage process. Sulfur is exported after pastillation.