Refineries. Oxygen for the Claus process.

Galp Energia operates three Claus units at Portugal’s largest refinery in Sines (120 km south of Lisbon).

Reference customer  
Galp Energia

Location  
Sines, Portugal

Gas application  
O₂ enrichment for intensification of Claus processing

Background  
Most oil refineries operate one or more Claus units for desulphurisation of gas streams rich in H₂S and in many cases containing considerable amounts of ammonia (NH₃) as well. Mainly due to legal regulations regarding the reduction of sulphur content in fuels, the amount of H₂S as well as NH₃ is increasing and often Claus units are becoming bottlenecks for the whole refinery.

Effects of O₂ enrichment  
By enrichment of combustion air with O₂, a Claus unit’s capacity in sulphur recovery can be increased significantly. A second beneficial effect is the fact that this raises the temperature within the Claus furnace, which in turn contributes to the stabilisation of the process, e.g. by more efficient destruction of NH₃.

Situation on site in 2005  
The three Claus units operated in Sines covered a total capacity of 180 tons of sulphur per day. Mainly due to NH₃ in the Claus feed, long-term stability of Claus operation was limited. In addition, an increased amount of acid gas could be expected for the future and additional use of O₂ appeared to be the measure of choice to tackle both challenges simultaneously.

Trials and measures  
In 2005, O₂ enrichment trials at two Claus units (including the determination of NH₃ destruction effectiveness) were performed in cooperation with Linde. The results clearly confirmed the expected effects; i.e. a considerable improvement of NH₃ destruction in the furnace and a sufficient capacity increase can be realised by this flexible, minor-investment solution.

A long-term trial lasting more than a year was started in summer 2006. It led to a permanent implementation of O₂ enrichment.
**Tailored O₂ injector OXYMIX™ implemented in the Claus unit’s process air pipe**

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### Number of Claus units operated with O₂ enrichment
2 out of 3

### Capacities (air-only mode)
50 tons of sulphur per day/plant

### H₂S in feed streams
> 80 vol.-%

### NH₃ in feed streams
A few percent (due to SWS gas processing)

### Installed tailgas treatment
Selective H₂S oxidation “Superclaus”

### Main purpose of O₂ application
Optimised NH₃ destruction and capacity increase (up to approx. 30%)

### Maximum O₂ content in O₂-enriched process air
28 vol.-%

### O₂ trials in cooperation with Linde
From 2005 to 2007

### Start-up
Routine operation with O₂ enrichment since 2007

### Hardware
Linde-designed O₂ dosing system including a control system (FLOWTRAIN®) and injector (OXYMIX™) for application of gaseous oxygen

### Mode of O₂ supply
Liquid oxygen (LOX) via tank/vaporiser system

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### Gaseous oxygen (GOX) supply train

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