



TECNICAS REUNIDAS



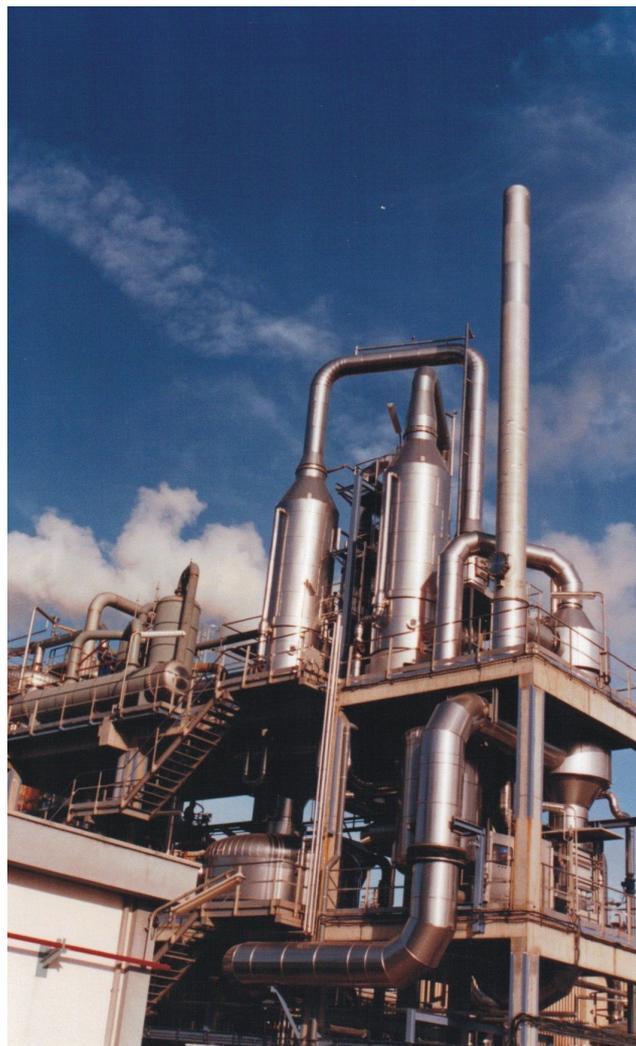
espindesa

NO_x ABATEMENT

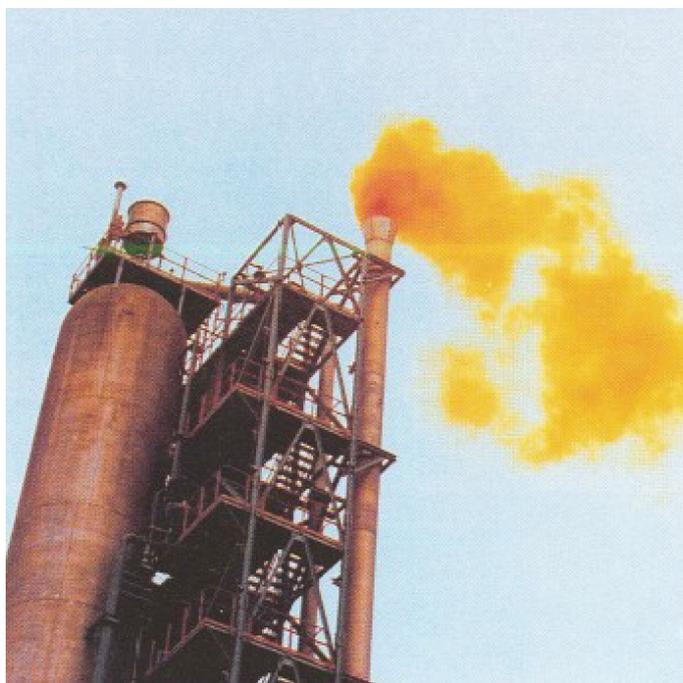
NO_x ABATEMENT CATALYSTS

The environmental regulations adopted in most countries, require that the nitrogen oxides content of the tail gas, exhausted to the atmosphere from nitric acid plants or caprolactame plants, is kept below 50 ppmv or even less. To meet those strict limits, many different techniques have been proposed, but catalytic reduction is the most widely adopted.

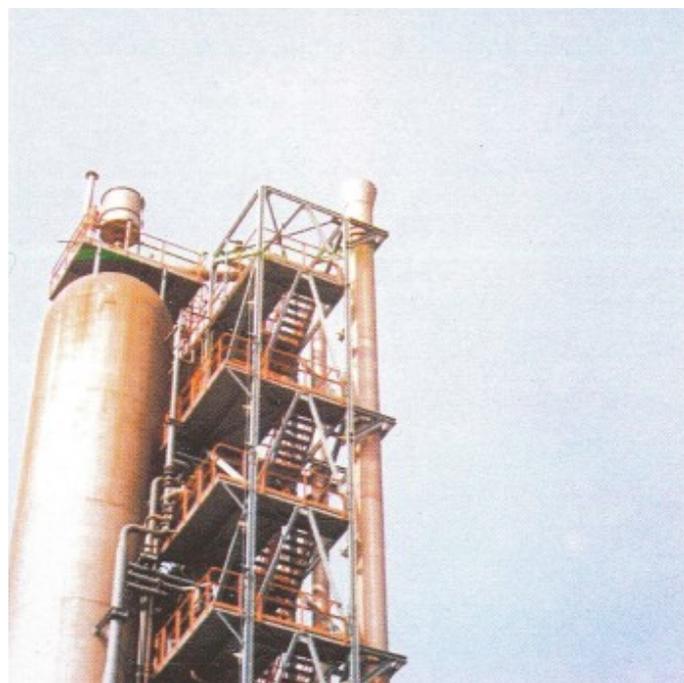
The ESPINDESA technology for NO_x abatement is based on the use of its own, or partner, selective catalyst.



Before Abatement

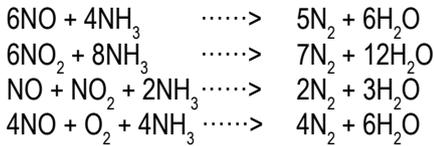


After Abatement



NO_x ABATEMENT

Ammonia reacts selectively with nitrogen oxides in the presence of oxygen. The chemical reactions which occur in the presence of an adequate catalyst are:



The heat evolved in the reaction increases the tail gas temperature by 5 to 25° C depending on the NO_x content of the tail gas.

Temperatures below 180° C must be avoided due to the risk of formation of ammonium nitrate-nitrite. Anyway, if due to a miss operation those salts deposit over the catalyst, ESPINDESA has developed procedures for regeneration "in situ" which restore the activity of the catalyst in few hours.

The operating pressure can range from atmospheric to 10 bar and the location of the catalyst can be either upstream or downstream the tail gas expansion turbine.

PROCESS DESCRIPTION

Gaseous ammonia is mixed with the tail gas in a Static Mixer. If the temperature of gas is lower than the optimum for the operation of the catalyst, the gas is preheated in a gas exchanger with the hot gas leaving the Reactor. A start up heater uses to be provided in those cases.

The mixture of ammonia and tail gas passes through the Reactor where the NO_x reduction to nitrogen takes place.

The purified tail gas returns to the Nitric Acid Unit. Critical parameters are recorded and backed with alarms. An interlock contact is provided to close the ammonia feed in the event of a shutdown of the nitric acid plant.

OPERATING REQUIREMENTS

Ammonia consumption

The ammonia consumption depends of the NO_x content in the tail gas but never is higher than 2-3% over the stoichiometric requirements.

Effluents

NO _x	less than 50 ppm
NH ₃	less than 5 ppm

PROCESS FLOW DIAGRAM

