

Industrial Air Purification

# CATALYTIC ABATEMENT PLANT



Ethylene Oxide Abatement for Medical Devices

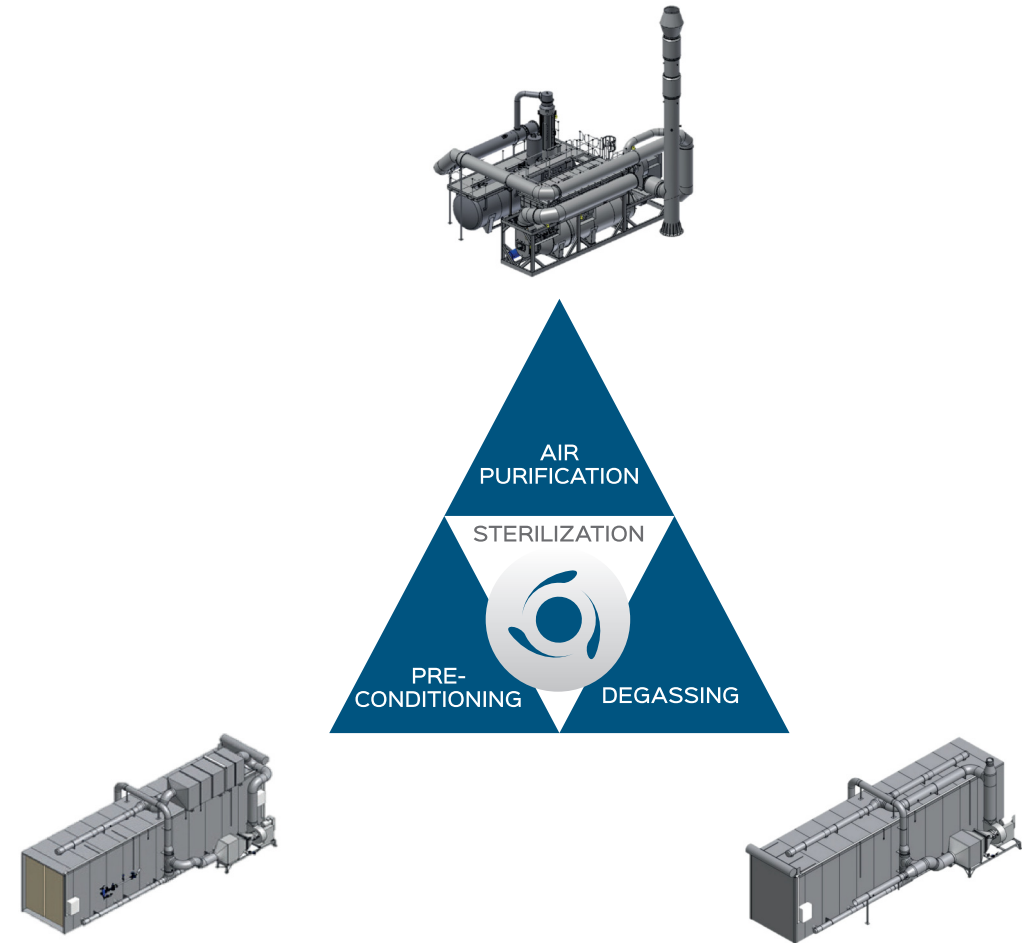
# Ethylene Oxide (EtO) Sterilization Process

Advancement in medical procedures has resulted in the increased usage of delicate instruments which cannot be steam sterilized. This is because they cannot withstand the higher temperatures or moisture of steam. Heat and moisture sensitive equipment require alternative methods of sterilization.

Ethylene oxide (EtO) is a common gas used for low temperature sterilization. It is a colorless, poisonous gas that attacks the cellular proteins and nucleic acids of microorganisms.

Ethylene oxide is a very toxic gas, which requires not only most possible attention during sterilization process, but also protection of operators, medical employees and patients handling and using medical devices due to the harmful effect on humans.

Safety of personnel and the environment is an important issue due to the harmful effect of EtO on humans. When this toxic gas is removed from product during the washing cycles, and during post conditioning; the exhaust vent from the sterilization chamber and all aeration air must be treated and completely purified before discharging to atmosphere.

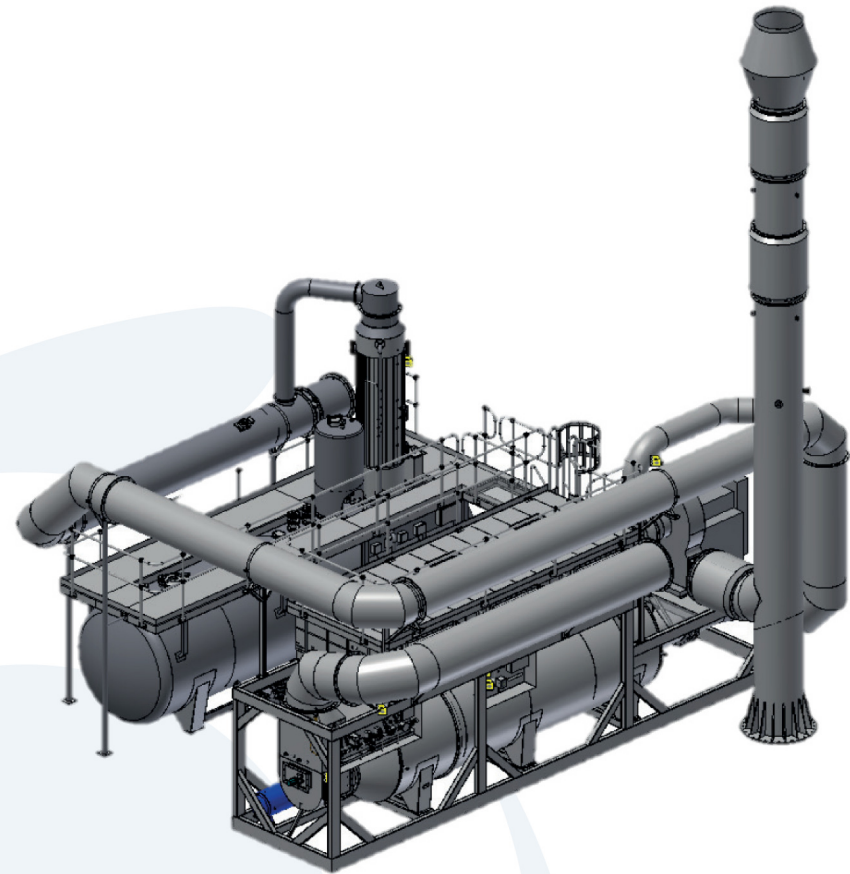


# Air Purification

Air Purification is the final step in the sterilization process, and without a doubt it's the most important step, due to the potential risk associated with flammability and toxic nature of the EtO gas. LESNI solution focuses on the safety, performance, and reliability of the purification system to handle variable and peak concentrations of ethylene oxide from the process various stages.

The LESNI Catalytic Abatement Plant (CAP) is installed to purify exhaust air from production facilities or processes contaminated with organic compounds, which does not contain any components that can poison the catalyst. The organic pollutants are converted into  $\text{CO}_2$  and  $\text{H}_2\text{O}$  on condition that all pollutants are compounds containing only carbon, hydrogen, nitrogen and oxygen.

The plant meets current European standards of  $0.5 \text{ mg/Nm}^3$  (TA-Luft), as well as the demanding new NESHAP final rule for "Ethylene Oxide Emissions Standards for Sterilization Facilities Residual Risk and Technology Review", published by EPA in April 2024, fulfilling up to 99.99% destruction reduction efficiency (DRE).





## No Chemicals, No Waste

The LESNI Catalytic Abatement Plant - two step system - has been specifically developed to eliminate the need for using chemicals (sulphuric acid) and to avoid the generation of waste (glycol) while offering a total solution for cleaning all fugitive emissions from the degassing and aeration of sterilized product, as well as the high concentrated vent exhaust from the vacuum pumps containing EtO (ethylene oxide).



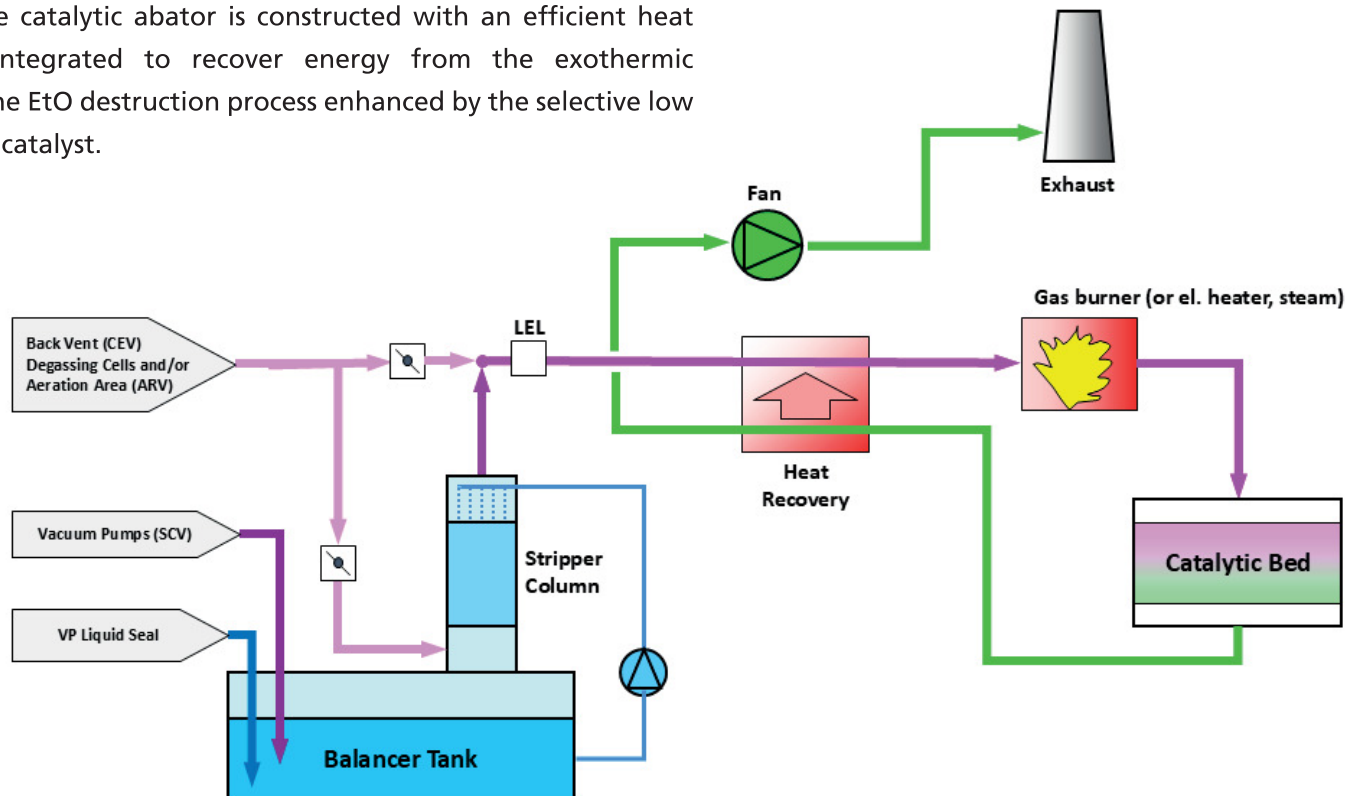


# Technology

The first step is the EtO balancer, where water is circulated from a buffer tank over a column, to generally equalize the variation in the incoming concentration of ethylene oxide; such that when levels of incoming EtO are high, the system absorbs EtO in the water and when levels of incoming gas are low the system strips EtO out from the water.

The second step is a catalytic abatement where the equalized concentration of EtO is converted (catalytically oxidized) into  $\text{CO}_2$  and  $\text{H}_2\text{O}$ . The catalytic abator is constructed with an efficient heat exchanger, integrated to recover energy from the exothermic reaction of the EtO destruction process enhanced by the selective low temperature catalyst.

Constant air heating is provided in the form of a gas fired heater to control set temperature before the catalytic bed to ensure appropriate conversion of the EtO over the catalyst, but also electric heater or steam battery could be used. The extract fan installed after the catalytic abator; provide necessary suction for extracting the process air through the system; thus keeping the complete plant operation under negative pressure.



## Ethylene Oxide Excellence

LESNI is not only offering single abatement units but also multiple units combined into one overall solution, designed as a **Modular Concept** to consider customers future growth and expansion plans from the first day. Furthermore, LESNI offers the **Redundancy Concept**, which allows the customer to have a certain redundancy designed and built up to 100% to ensure that downtime is reduced to a minimum.



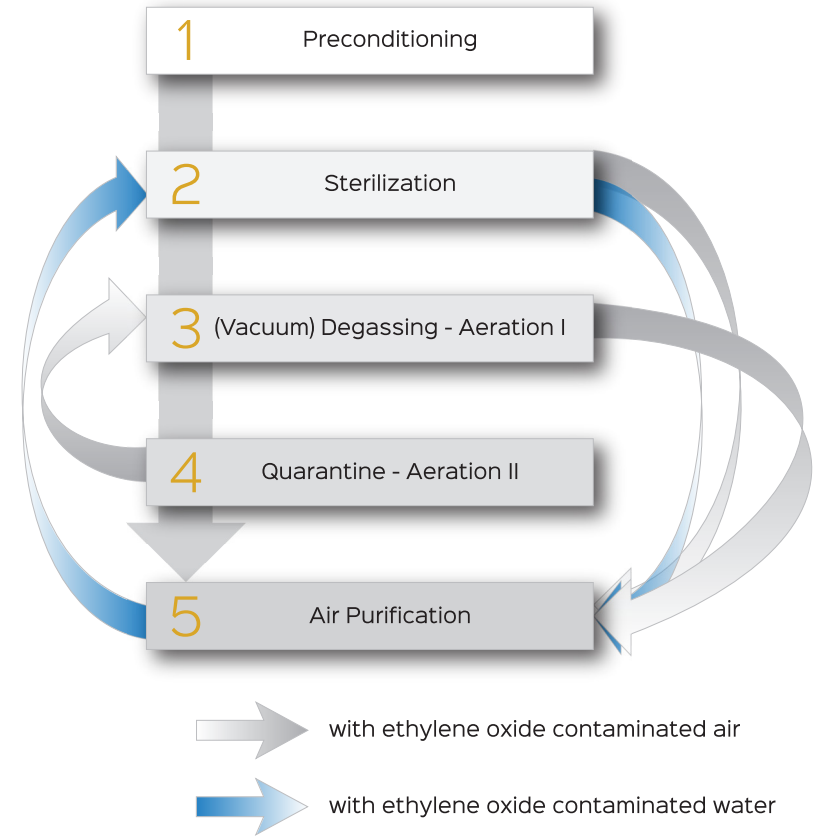
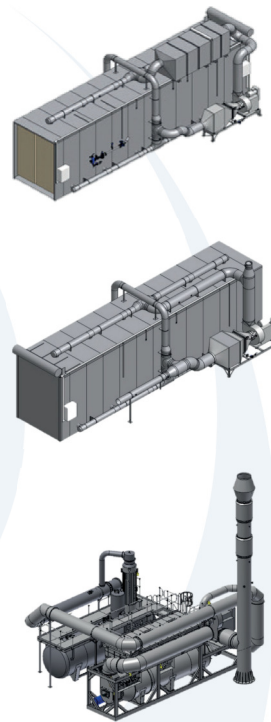


# Ethylene Oxide Excellence

The integration of the Preconditioning and Degassing Cells with the well proven LESNI - EtO Catalytic Abatement System, ensures also EtO elimination and destruction in the final discharged exhaust.

This complement LESNI long history and contribution to the sterilization of medical devices industry, while help to achieve our goal and commitment to product excellence for this process.

During the last 37 years LESNI has delivered more than 150 installations for Ethylene Oxide Abatement to medical devices manufacturing companies and contract sterilization facilities in 40 countries.

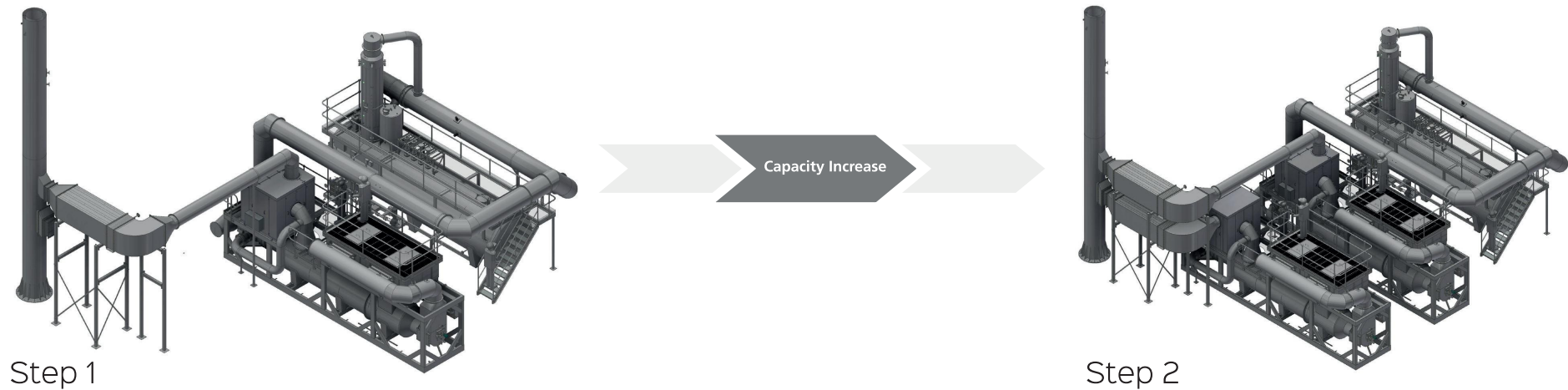


# Ethylene Oxide Excellence

LESNI continues to support customer requirements by matching production capacity at different phases of their facility lifecycle.

Development work takes into consideration the final capacity and actual needs of engineering and construction in a modular concept to reduce immediate capital investment and prepare the system for future expansion.

Design is based on building and extending the abatement plant in two steps.



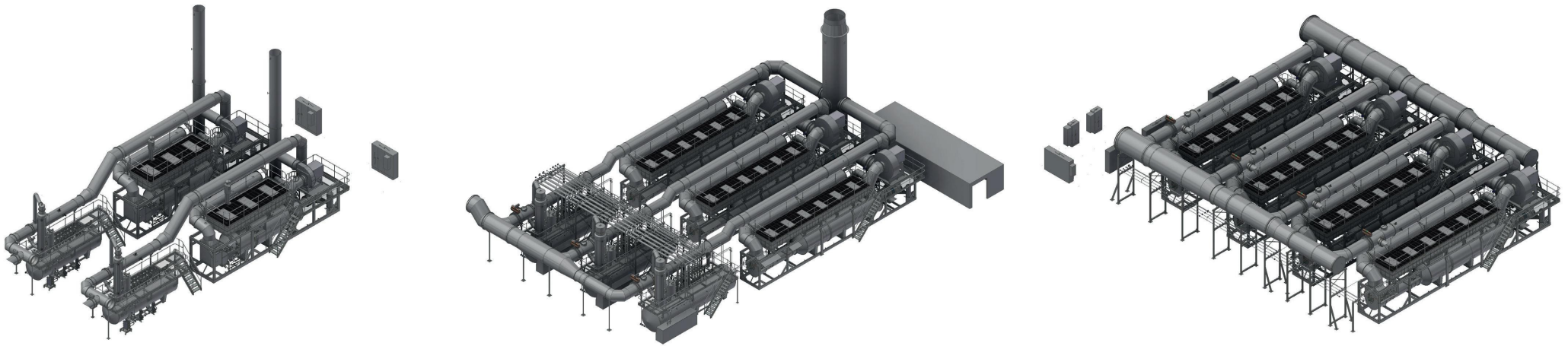


# Ethylene Oxide Excellence

LESNI Air Purification Solutions also includes the special construction of abatement systems.

Designed to offer a redundancy concept, complete with interconnecting ductwork, actuated valves, and controls.

This feature allows the sterilization facility to have a certain redundancy designed and built up to 100%, to reduce the downtime to a minimum.





## Ethylene Oxide Excellence

The LESNI service team continues to keep the plant function and operation in optimum conditions by performing the regular Preventive Maintenance and Main Service and supplying the necessary spare parts recommended. In addition, the LESNI Catalytic Abatement Plants are equipped to facilitate the 24/7 - Remote Support to the customer 365 days a year.

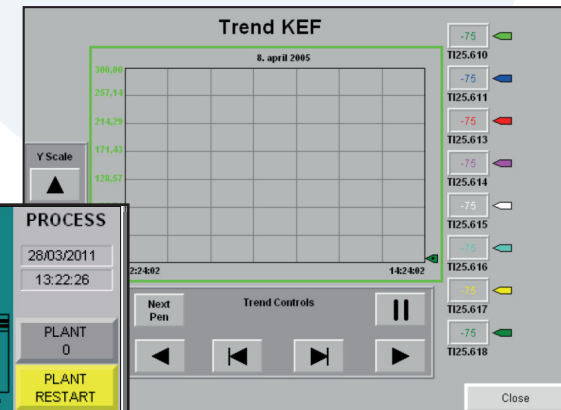
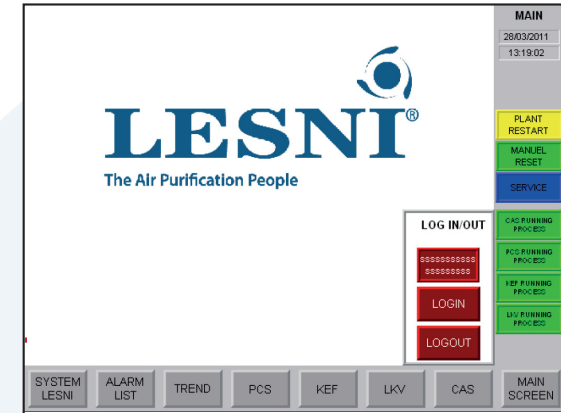
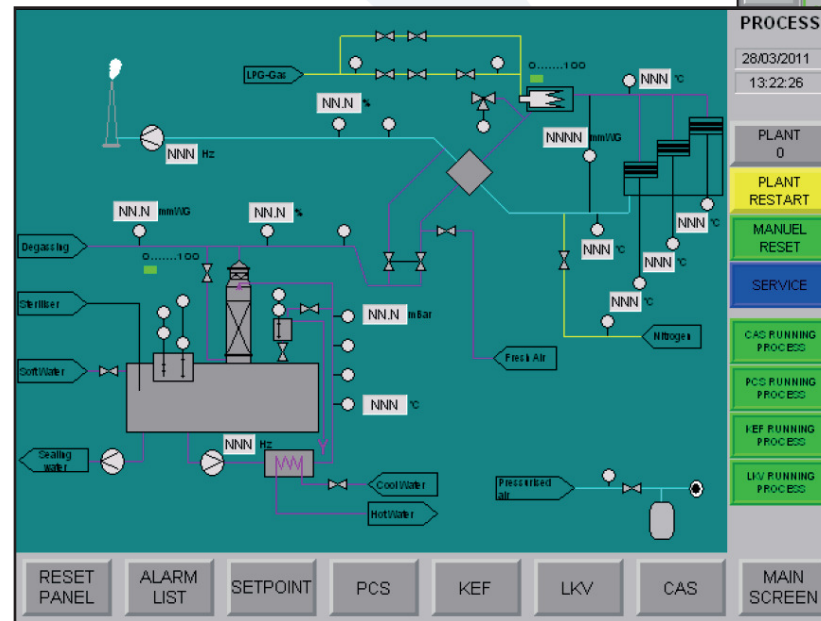


# Safety and Control

The plant is controlled by a control system from which all operating, supervising and controlling of the plant are performed.

The control panel shall be installed in a suitable place near to the operating technician or allow some functions to be remotely controlled.

In the control panel are all the needed terminals for connection to the balancer, catalytic abator and any other external communication. The LESNI system will be designed to obtain the purification required by the authorities with the highest degree of security and efficiency.





Air purification by physical and chemical scrubbers



Activated carbon plants for VOC purification, odour removal and solvent recovery



Air purification systems for removing mist, dust and particulate matter



Safe and efficient catalytic and thermal oxidisers for VOC purification and solvent destruction



LESNI has developed a variety of innovative solutions for specific pollutants and processes in operation worldwide

  
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