

L&K Anlagentechnik Energy -, Industry and Air Systems





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Company Profile

L&K operates in modular construction and design for all sectors of plant construction.

Our systems are used in shipbuilding, industrial systems and power stations. We provide the general mechanical engineering sector with modular systems, electrotechnology, electronic systems, measurement and control systems, all from one source. All systems for fuel and lubricating oil supply, cooling and heating and filter or separator-based processing are developed, designed and manufactured using CAD systems such as Autocad and EPLAN4. Only components that have been tested and considered perfect for the intended purpose are used. All comply with international standards. Our supply program includes standard equipment and tailor-made systems for solving specific tasks. Designs are provided to national or international standards, classification company or customer specifications. Our philosophy is reliability and control under operating conditions. All components and modules are tested for full functionality.



Qualification

In the electrotechnology sector, we manufacture control cabinets with electromechanical standard and use programmable logic controller (PLC's) from leading manufacturers for intricate applications. In the mechanical engineering sector, we design and construct pneumatic compressor stations, oil and water modules to specification, as well as waste treatment, oil recycling and cooling and preheating systems. We also undertake project planning work, drawing up designs and documentation. We manufacture our products to international regulations such as API, AD and HPO or classification company requirements or customer specifications. Welders qualified to DIN or ASME standards are the ideal precondition for optimum work results. Commissioning, start-up and after-sales service is carried out by our specialist electro-technicians and service engineers.



Market + Products

For the following market sectors we design and produce systems and components:

foundry & steel industry, Mining industry, Cement industry, Chemical & petrochemical, Automobile industry, Shipping & Marine, Powerplants, Gearboxes, Hydraulic systems, Compressors, Slow to fast running diesel engines, Presses & shearing machines, Shredders, Extruders

Supply systems for the energy sector
Supply systems for the industry sector
Measurement and control systems

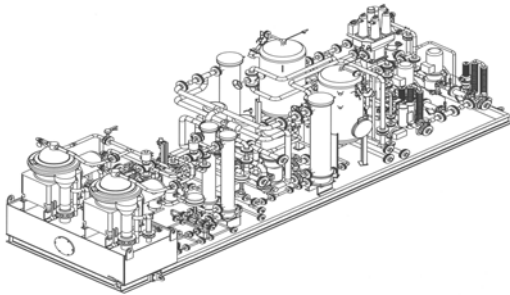
Supply systems for the energy sector

Lubricating oil systems, Separators and filter modules, Booster modules, Pre-heating and heating systems for water, lubricating oil, light and heavy oil, (heating media electrical, steam or thermal oil), Nozzle cooling, Leakage oil disposal, Starting air systems, Air compressor station, Cooling systems, Heat exchangers, pipe bundle or plate design, Radiator coolers

Fuel Systems

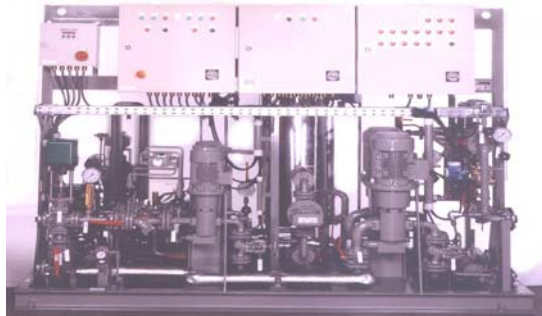
We have experiences with Fuel-Systems and invested into research in order to progress these systems. We are today in the position to adapt the Fuel-System nearly to the consumer (Diesel-Engines) in order to provide maximum operation safety and best conditioning results with respect to low tear and wear cost at the plants. Optimal fuel conditioning causes also a more efficient use of the fuel. To this, also contributes the careful heating of the HFO step by step.

Combined Fuel and Lubeoil System together with Booster Module



Booster Module

Viscosity sensor



HFO / LFO Supply Module

HFO Separator Modul



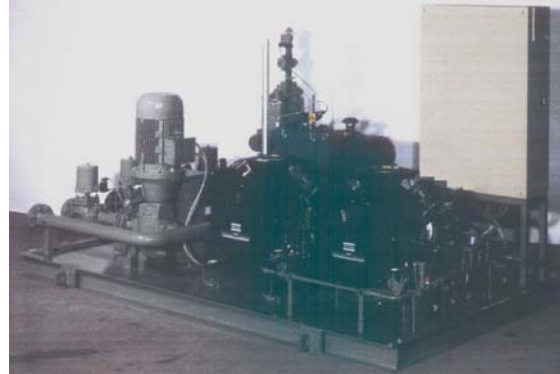
Lubeoil and Air Sytems

For Lubeoil and Air-Supply, two systems are at disposal, that have demonstrated in many applications their function and reliability. The Lubeoil Reconditioning System is belonging to the individual industrial and powerplant purpose or where the Prelubricating and Air Supply System is arranged centrally for a complete Powerstation.

Luboil Conditioning



Starting Air and Relubricating



Combined Preheating and Prelubricating



Electric Preheater Modul



Cooling Systems

For industrial and powerstation purpose, only economic Cooling Units are significant. As a result therefore

Flow Cooling

is hardly ever used. This method demands high water consumption, high performance materials for the adaption of the Cooling Elements and Cooling Lines to the water quality, e.g. brackish water and is, due to permanent heating of the water reservoir, hazardous to the environment.

Circulation Cooling

is a practically closed system which has turned out to be the most economic approach to cooling in industrial and powerstation purpose. This system only demands a single fill with cooling medium and, during operation, the compensation of losses due to spray, leakage or evaporation.

For **Circulation Cooling**, two different Re - Cooling - Systems can be used.

I.) Cooling Tower or Evaporation Cooling Tower

This system transfers the absorbed heat to the atmosphere by evaporation. Decisive for the design is the **wet bulb temperature**.

Cooling Towers require permanent input of Feed Water, mainly to compensate the evaporation (ca. 2%) and to maintain the water quality, especially in atmospheres contaminated with dust or chemical substances.

Ambient conditions with temperatures below 0°C demand special consideration of eventual frost damage on the Cooling Tower itself or the danger of icing in the surrounding of the Cooling Tower.

Cooling Towers are working at comparatively low noise level.

It is recommended for **Circulation Cooling Systems** to install heat exchangers between consumer and Cooling Tower. Only in this way, the appropriate cooling can be provided.

II.) Radiator Cooling Unit

This system transfers the absorbed heat into the atmosphere via a ventilated finned - pipe - cooling - block (Honeycombe).

The most important aspects for the design are cooling air temperature and installation height (a.s.l.).

It is not necessary to provide additional Feed Water. Refilling becomes only necessary in case of leakage or other loss in the system.

The ambient conditions must be carefully considered. In sea- air atmosphere or in chemically contaminated atmosphere, special resistant alloys are available or resistant coatings can be applied to the Cooling Block. In dusty atmospheres, there are used wide fin pitches in the Cooling Blocks.

Temperatures below 0°C can easily be managed by using additives in the Cooling Water, preventing it from freezing. Anyway, in case of direct cooling of Lubeoil in a Radiator Cooling Unit, ambient temperatures of +8°C should not be submerged due to the high viscosity of the Lubeoil under cold ambient conditions.

Radiator Cooling Units are equipped with fans, which usually are driven by electric motors. Under economic layout of the electric motors, the total consumption of the installed electric motors will not exceed 2 - 3 % of the output of the genset.

A Powerstation with an installed output of e.g. 25 MW - 25000 kW/h will certainly not exceed an electric consumption of 500 kW/h for the fan motors in the Cooling Unit. Nevertheless, this is electricity, which preferably should be sold from the Powerstation to its customers.

Of course, this "loss" due to the operation of the fan drive motors under 100 % load can be minimized to a certain extent. This is achieved by adapting the cooling capacity to the cooling - air - temperature, e.g. taking advantage of the changing differential temperature during day / night operation or taking advantage of the differing temperatures throughout the year, requiring sometimes only a reduced volume of cooling air, what means at the same time a reduced electric consumption of the installed fan drive motors.

L&K has equipped in such applications several times Radiator Cooling Units with Frequency Control Units, which influence the output of the electric motors depending on the ambient temperature, resulting in most economic operation. An example for this application is a consumer with about 100 kW/h installed electric motor output. Due to differing differential temperatures in day / night operation, there is a mean saving of 40 kW/h throughout the year. The necessary investment for the Frequency Control Unit paid out within more or less one year.

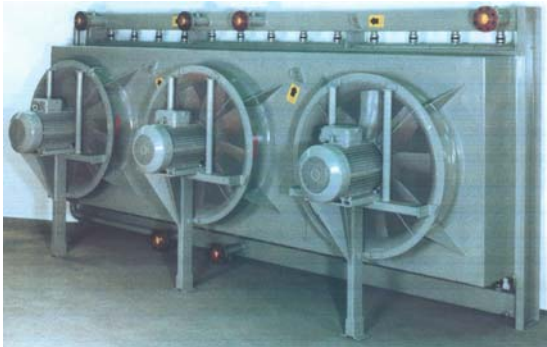
Attention should always be paid to the noise level of Radiator Cooling Units. In L&K standard, Radiator Cooling units are designed for sound pressure levels of more or less 95 - 98 dB(A) - in 1 m distance. That means, the sound pressure level is about 65 dB(A) - 100 m. Basing on our experience, we are in the position to carry out special calculations to achieve better noise levels.

Also when noise level is a problem, we recommend the use of a Frequency Control Unit. During the night, when temperatures drop, the fan motor speed can be reduced. Besides economic reasons, the effect of this speed reduction is also the reduction of the noise level due to the lower fan speed.

Water supply Modul



Radiator Cooling differend design and ambient condition



Supply systems for the industry sector

Cooling - heating - filter systems, Oil recycling systems, Water and air-cooled heat exchangers
 Electrical, thermal oil and steam-heated continuous-flow pre-heaters, Low-pressure gear pumps, Low-pressure double filters, Air compressor station, Medical Air compressor station

Lubeoil and water Systems

For Lubeoil, water and Air-Supply, we have demonstrated in many applications function and reliability. We find here normally single water or lubeoil units for each consumer (turbine, gearbox, zement mill etc.) and one common air unit for a complete industrial plant.

Cooling - heating - filter systems for a gas compressor



Cooling - heating - filter systems for a centrifugal or piston engine



Air compressor station

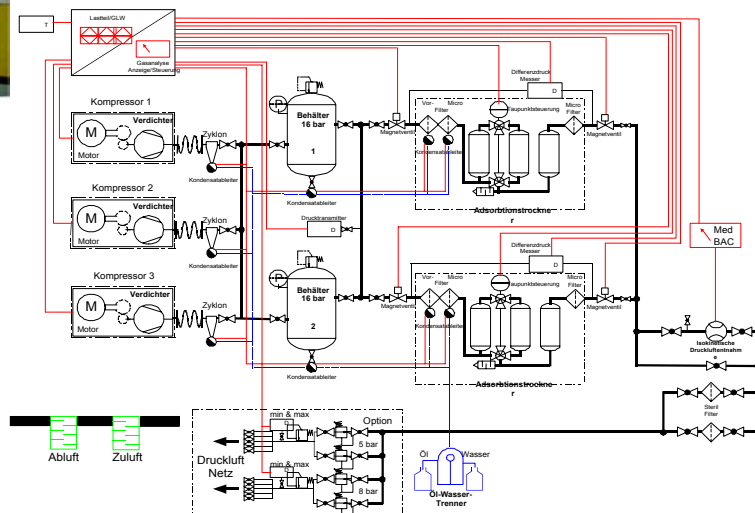
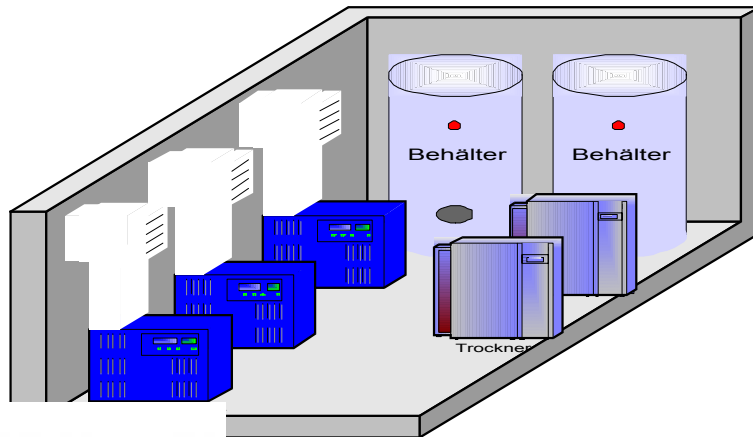


Cooling - heating - filter systems for a steam turbine



Medical Air compressor station

Medical air is in the future to be treated as a medical supply. Because of the state of existing equipment which is in part out of date or simply not present, a new market for this necessary equipment is opening up. The repair or modernisation of old equipment is too expensive. The alternative of racks of bottled air are, from an economic efficiency point of view, far too expensive in comparison with the medical air delivery equipment described here. The ratio of 1:10 for a normal operational life of ten years refers to all the requisitioning, servicing and operational costs, i.e. racks of bottled air are 10 times more expensive than comparable air supply equipment. Purchase of this piece of equipment does not have to be made as full capital investment, it is also possible to provide a certain number of m³ of air supply per year. This enables the operators of care homes etc. to have calculable fixed costs. As a further option, we recommend an monitoring device in order to achieve a high process reliability through continuous monitoring of, for example, the oil volume and the compressed air.



Measurement and control systems

Temperature - pressure - flow rate - levels
 Viscosity measurement and control systems in pneumatic or electronic design
 Process visualisation
 Frequency converter-guided control systems
 Electronic and electromechanical control systems

**PT 100, Industrialregulator, pressure gauge
 Levelswitch and combined systems**



**pressure gauge different design with
 spring contact or electronic device**



**electronic industrial regulator,
 electronic measure device PT100**



viscosity sensor



**control cabinet for industrial use
 control- and power line**



**control cabinet for shipyard
 viscosity control**

