Accumulator Technology 30.000

Filter Technology 70.000

Process Technology 77.000

Filter Systems 79.000

Compact Hydraulics 53.000

Accessories 61.000

Electronics 180.000

Cooling Systems 57.000

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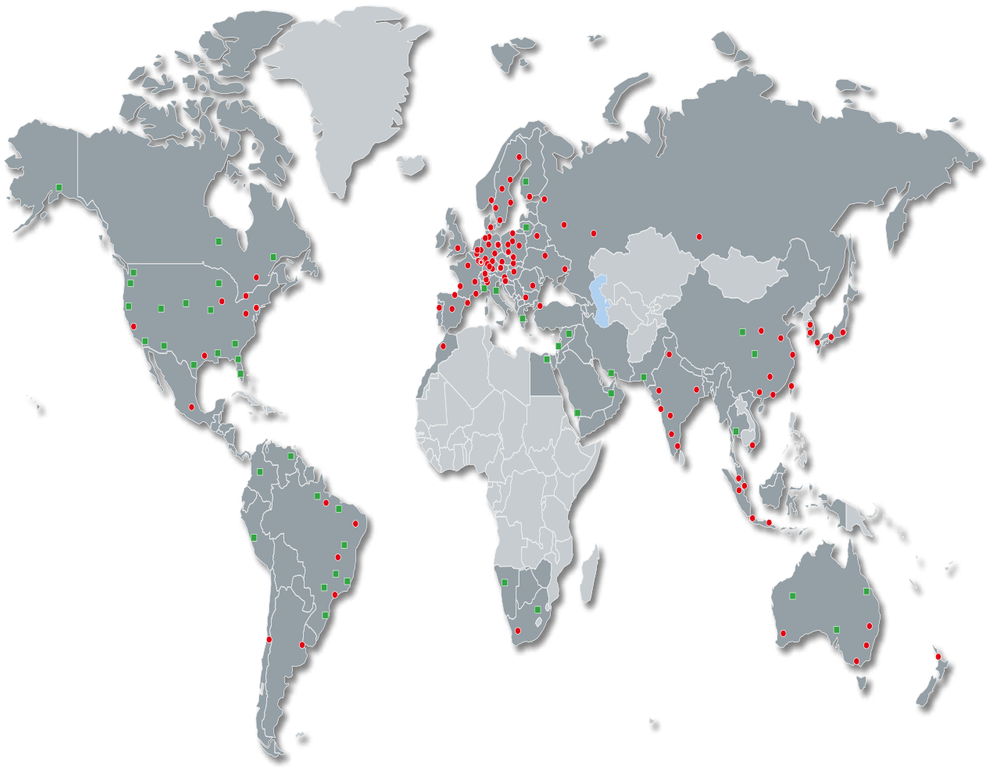

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**NOTE**

The information in this brochure relates to the operating conditions and applications described.

For applications and operating conditions not described, please contact the relevant technical department.

Subject to technical modifications.

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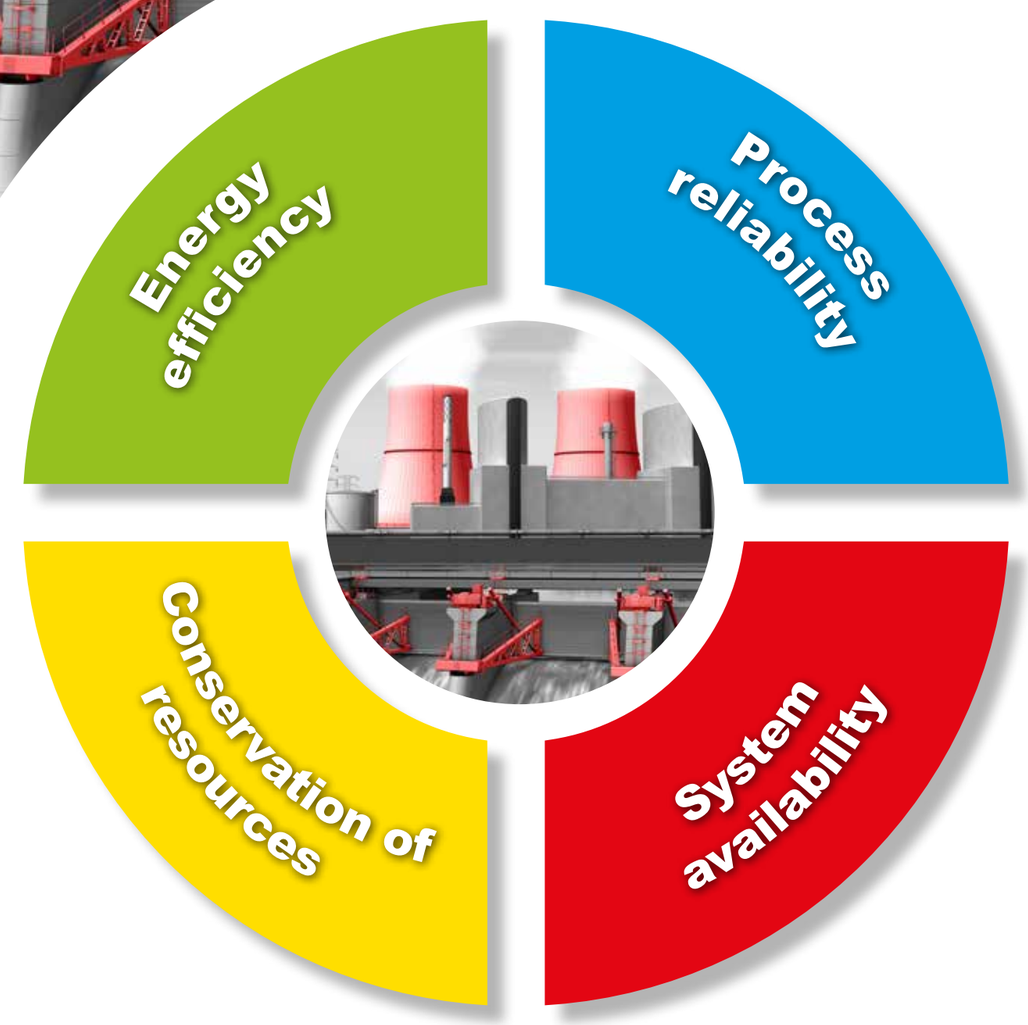
HYDAC INTERNATIONAL

# Fluid Engineering for Power Plants

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# Fluid engineering
## for power plant operators

### Your professional partner for power plant service

It is not only Germany's switch to renewable energy that is presenting new challenges for the operators of power plants.
Increasing competition, cost pressure and not least the changes in power plant operation demand high levels of flexibility in the
planning of maintenance, service and modernisation processes.

HYDAC would like to support you with a cost-optimised and individual assessment of all necessary processes in power generation, periodic maintenance and modernisation.

Our extensive product range, which includes customer-specific components and system solutions, can help to ensure efficient and reliable plant operation in the long term.

**Fluid engineering for power plant operators:**

For HYDAC this means:
"Optimising your fluid-power plants, function groups and key components!"
With regard to:

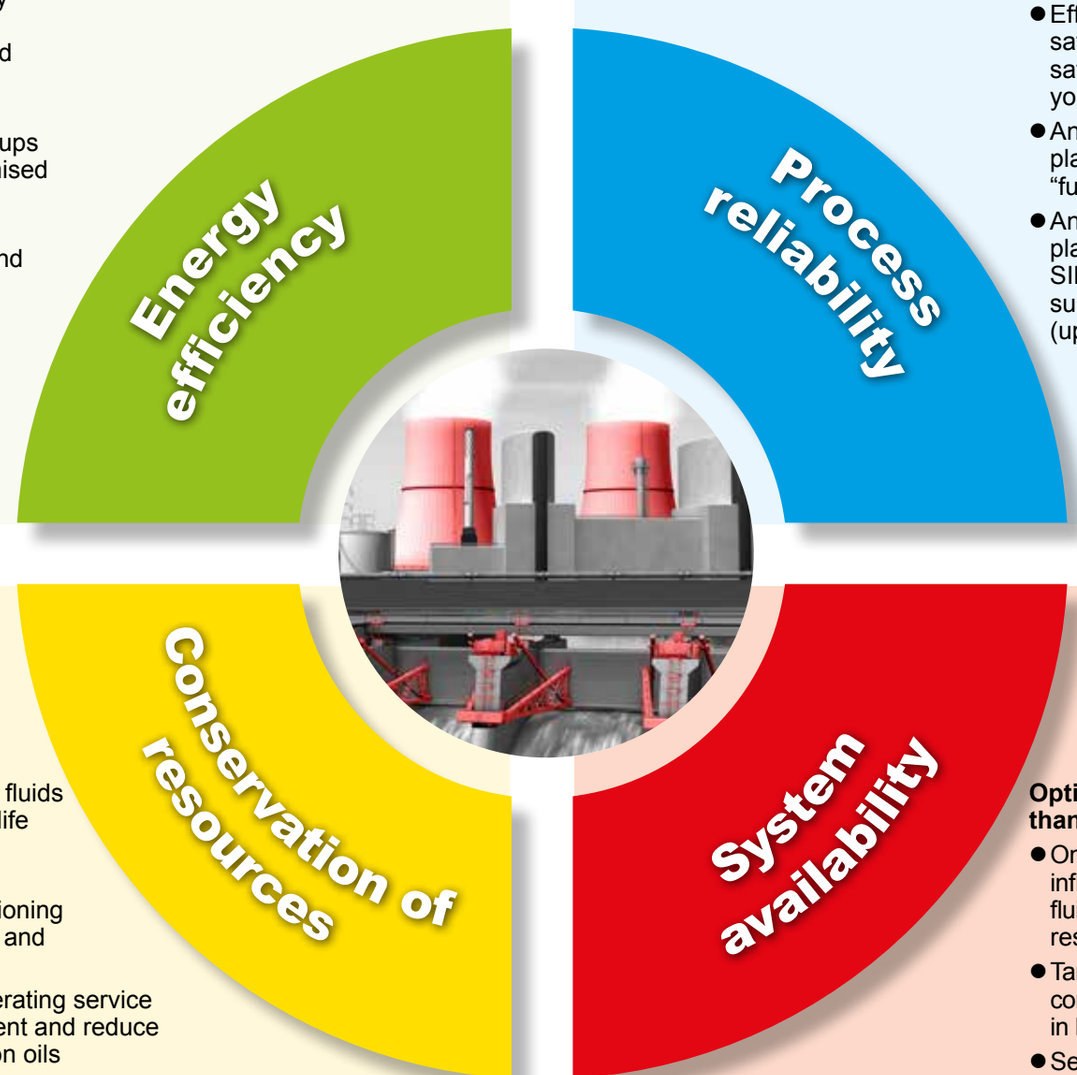
- Energy efficiency
- Process and plant reliability
- Conservation of resources
- Plant availability

## Energy efficiency

- **HYDAC energy check:** we can perform an analysis of the thermal and energy load of plants and hydraulic systems used, with a view to reducing this load
- To modernise your plants, HYDAC can overhaul your hydraulic systems and fluid-power function groups by retrofitting them with energy-optimised components and systems
- Modernisation and renovation of hydraulic function groups, systems and plants in the main power plant areas, such as the turbine and the generator

## Process and plant reliability

- Efficient implementation of statutory safety regulations and health and safety at work in the operation of your plants
- Analysis and optimisation of plants and systems with regard to "functional safety"
- Analysis and modernisation of plants by using functionally safe, SIL-compliant components, subsystems and hydraulic plants (up to SIL 3)




## Conservation of resources

- Reducing contamination of operating fluids in the plants and increase of service life e.g. (hydraulic fluids, lubricants, process water, gases etc.)
- Application-optimised filtration/conditioning and preparation of operating fluids in and main flow and bypass flow
- Use of oil-conditioning and oil-regenerating service units (even during operation) to prevent and reduce varnish in the hydraulic and lubrication oils
- Cost-optimised conditioning of process media as part of plant maintenance (process water, sealing oils, fuel gases, fuel oils, coolants, etc.)
- Reduction of fluid quantities, and thus active conservation of resources, by using OXiStop fluid engineering products
- Cost reduction thanks to extended fluid service life

## Plant availability

**Optimisation of plant availability thanks to:**

- Online monitoring of the main influential parameters of the operating fluids in your plant, resulting in faster response times for corrective action
- Targeted optimisation of the components and function groups used in hydraulic and lubrication circuits
- Servicing and maintenance strategies adjusted to suit the operator's usage profiles, along with specially optimised "tools"
- Worldwide service for our own systems and components and individual spare parts management

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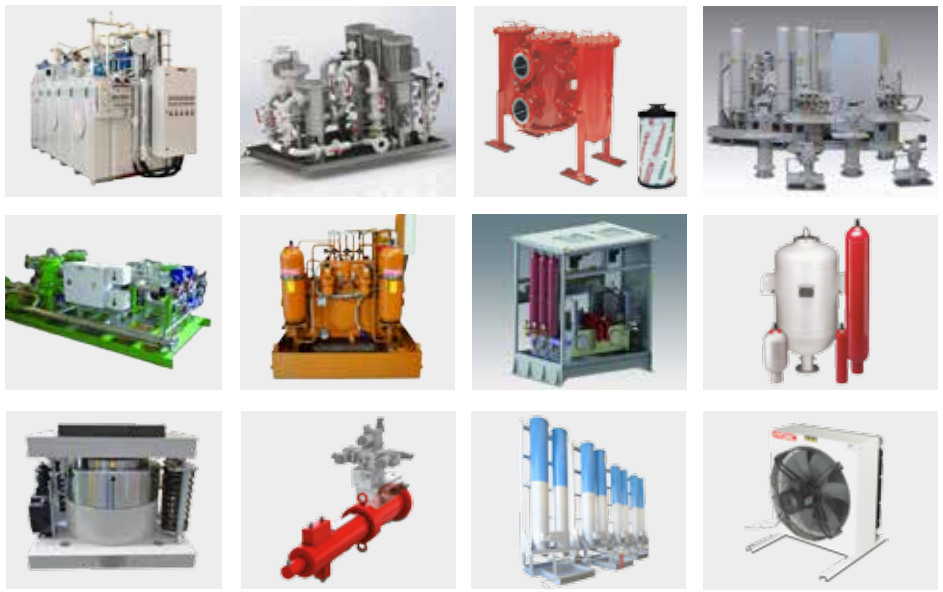
# Fluid engineering
# for power plant operators and energy suppliers

HYDAC is one of the leading suppliers for fluid power, hydraulics and electronics. With its extensive product range and its expertise in development, production, sales and service, HYDAC is a valued partner for all its customers in the power plant sector, with a global presence.

Our quality and environment certification to ISO 9001/2000 and ISO 14001 denote first class quality and responsible management of our resources.

## HYDAC is a long-standing system provider for leading power plant equipment suppliers Application expertise in the provision of power plant equipment



## Examples of key figures used in the assessment and decision-making to modernise your plants and increase efficiency

**Energy efficiency**

Example: hydraulic installations in the power plant

- Energy costs (€) = electricity price (€/kWh) x electricity consumption (kWh/year)
- $CO_2$ emissions/year (kg) = power consumption (kWh) x (0.5–0.6)*
- Optimisation costs (€)/amortisation (days)

* = $CO_2$ emission factor depending on the local energy mix

**Process and plant reliability**

- Costs (€) = insurance costs (€) + staff absence (€)
- Optimisation costs (€)/statutory requirements

**Conservation of resources**

Example: oil-based operating fluid in the power plant's hydraulic power units

- Costs of operating fluid (€) = fluid consumption (l/year) x fluid price (€/l) + fluid disposal (€) + wage costs (€)
- $CO_2$ emissions (kg) = $CO_2$ oil production (kg/l) + $CO_2$ disposal (kg/l )
- Optimisation costs (€)/amortisation (days)

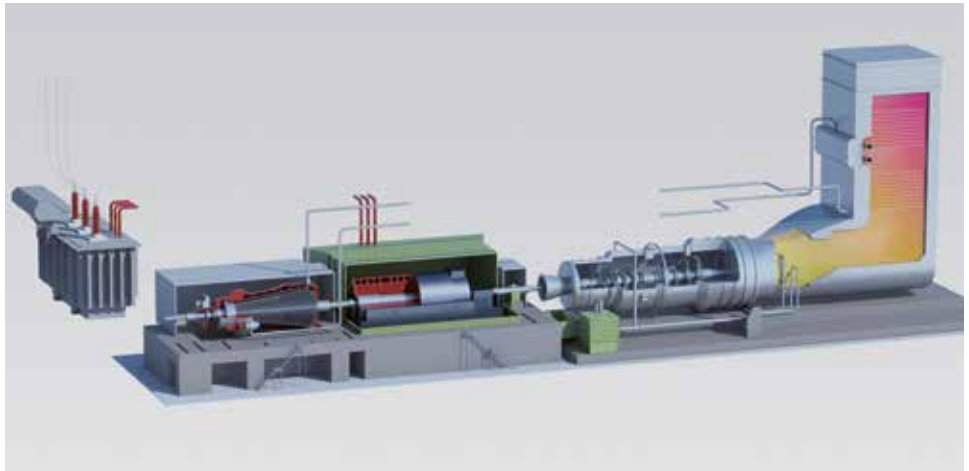
**Plant availability**

- Downtime costs (€) = production loss (€/day) + material costs (€) + wage costs (€)
- Optimisation costs (€)/amortisation (days)



## In thermal power plants

The use of HYDAC hydraulic, lubrication and cooling systems with HYDAC optimised components is widespread in thermal power plants.



**Fuel supply and residue disposal**

- Hydraulic systems for unloading, settling and feed plants
- Fuel conditioning

**Heat generation**

- Bunker, allocator, pulverizing plants
- Hydraulic systems for fans and flues of the main burner, burn-out grates
- Water filtration used in $NO_x$ conditioning in flue gas extraction
- Filtration to steam, water and gas circuits

**Main Machine Set (Turbine, generator)**

- Steam and gas turbine control
- Generator lubrication, gearbox lubrication, gearbox cooling
- Cooling systems (water and gas)
- Feed water systems, feed water filtration systems

**Balance of Plant, "BoP"**

- Retrofitting cooling systems, fire protection devices (water filtration)
- Dewatering units and fluid-handling devices for your service in the power plant
- Retrofitting stand-alone transmission drives for turbine applications

## In hydroelectric power plants

In all types of hydroelectric power plants and in hydraulic steel structures, hydraulic, lubrication and cooling systems are equipped with HYDAC optimised components as original equipment and retrofits.

**Hydro mechanical/ main inlet valves**

- Hydraulic systems and hydraulic drives for doors, valves and flaps

**Main Machine Set**

- Hydraulic systems and lubrication and cooling plants for turbines and generators
- Seal water filtration and water-lubricated bearing systems

**Balance of Plant, "BoP"**

- Retrofitting cooling systems, fire protection devices (water filtration)
- Dewatering units and fluid-handling devices for on-site service

# Energy efficiency

Generating power often involves a lot of energy being wasted unnecessarily. When fluid power components are used or set incorrectly or worn, they have greater energy consumption or work beyond the ideal operating point. This causes them to produce excessive heat and extra measures must be taken to cool them down.
The HYDAC energy check can help you to identify weak spots in your processes and restore maximum energy efficiency in your plants.

**1**

**Energy check**
- Identifying high energy consumption in fluid power units and offering advice for performing corrective measures
- Inspecting process-related parameters

**2**

**Modernisation**
- Retrofitting stand-alone actuators and switches for power plant operators/ customers
- Modernising “low-pressure” systems with energy- and cost-efficient stand-alone drives for fittings that control or switch gas and steam

**3**

**HYDAC KineSys energy-efficient systems**
- With energy-efficient variable-speed drives, e.g. in hydraulic steel structures or in turbine control applications with electro-mechanical drives

**4**

**Renovation**
- Energy-efficient, retrofitted first filtration stage with self-cleaning process filters for cooling water conditioning in the thermal power plant replacing older, very large sand filters



## HYDAC products for energy efficiency in the power plant

### Service package: energy check

- As-is assessment
- Rectification of energy defects
- Modernisation with energy-saving systems and components
- Optimisation

### Cost-optimised drive strategies

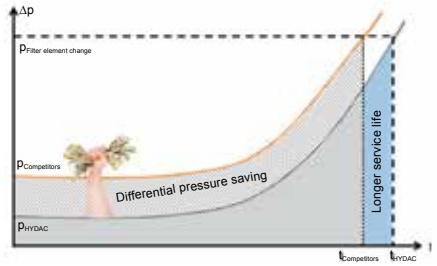
- **Stand-alone electro-hydraulic actuators for turbine control:**
  The basis for the stand-alone drive strategy EHC-AA is the use of hydraulic accumulators to replace mechanical springs.
  The “spring characteristics” can thus be adapted to suit the particular process requirements.
- **Electro-mechanical axle:**
  Electro-cylinder KineSys HEZ

### KineSys variable-speed hydraulic power units (Kinematic Systems)

- In the individual project planning of drive solutions, such as those used in hydropower, energy-efficient hydraulic power units are based on KineSys drive components
- Modern simulation and system engineering tools assist with the dimensioning

### Automatic back-flushing filter AutoFilt® and inline filters

- Conditioning of process water for turbine/generator cooling
- Seal water filtration to increase the service life of turbine slide ring seals



# Process reliability

With the introduction of the Industrial Safety Regulations BetrSichV, the employer/operator must fulfil certain duties concerning the provision of work equipment and its use at work, safety when operating installations subject to monitoring and the organisation of industrial safety and health at work.
As a manufacturer of products governed by the **Pressure Equipment Directive**, HYDAC offers support in implementing the BetrSichV for hydraulic, lubrication and EX plants that require monitoring. We can compile safety strategies and perform corresponding risk assessments with safety evaluation. To ensure that hydraulic accumulators are used safely in the power plant, HYDAC can also train workers as “competent persons” in accordance with German technical rules TRBS 1203 for pressure vessels.
In connection with HYDAC fluid engineering, we can provide maintenance strategies, perform periodic leaktightness tests on pressure vessels if desired and also perform any required pressure vessel modernisation work.
We can also offer additional services to modernise your plants, such as retrofitting functionally safe components and systems (e.g. hydraulic safety blocks and drives up to Class SIL 3).

**1**

**Accumulator service**

- Logging/classifying hydraulic accumulators of all types in the power plant
- Compiling the risk assessment
- Compiling inspection deadlines and log books
- Performing periodic tests and certification

**2**

**Stat-Free®/Stat-X® element technology**

- Retrofitting special Stat-Free®/Stat-X® filter elements to prevent undesirable electrostatic discharge caused by modern hydraulic oils and lubrication oils
- with inspection and certification

**3**

**TransformerCare Unit TCU**

- Increases the service life of transformer oils
- Breakdown voltage rates like new if the insulation oils receive permanent gentle conditioning in the bypass flow (separation of air and moisture)

**4**

**SIL control blocks/ hydr. drives**

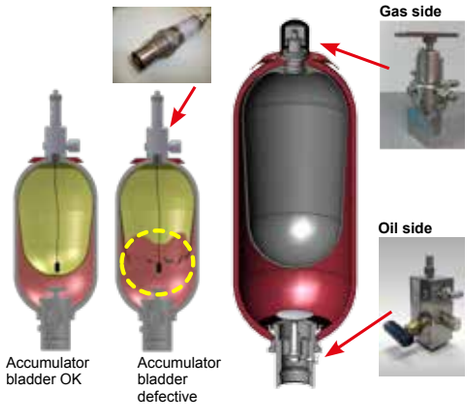
- Logging/ classification and safety assessment of hydraulic control systems, axles and actuators
- As applicable, modernisation of plants by retrofitting functionally safe components



# HYDAC products for process and plant reliability in power plants

## Hydraulic accumulator service

- Charging and testing unit for hydraulic accumulators
- Safety valves for oil and gas sides (Refurbishment, modernisation)
- Testing unit for safety valves and approval on request



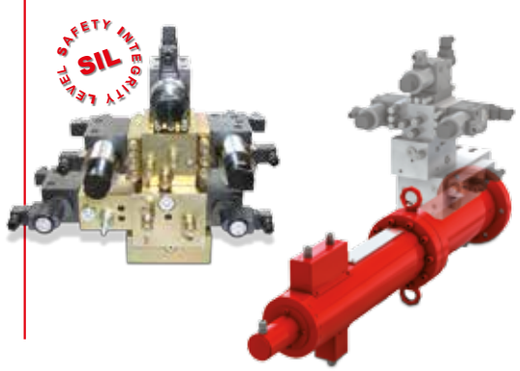
## Filtration strategies for safe operation

- **Filter elements: Optimicron® Power, Stat-Free® and Stat-X®:**
  Specially developed for use in modern, low-conductivity oils and fire resistant fluids (FRF)
- **Change-over inline filters RFLD/AFLD:**
  - Lubricant filters
  - Fuel-oil filters
  - Also available in stainless steel acc. API614
- **Oil mist separators "STENO"**
  Units for separating oil mist with liquid-gas coalescer technology, modular made and standardized

## Fluid conditioning systems:
FluidAqua Mobil **FAM,**
TransformerCare Unit **TCU** and
VarnishMitigation Unit **VMU**

For dehydrating, degassing and removal of oil ageing products

- By using FAM dewatering and filtration units continuously during plant operation, integrated conditioning of the lubrication media is assured.
- TCU used to continuously degas, dehydrate and filter the insulation oil
- The service-friendly VMUs/VEUs are used to effectively remove oil ageing products (varnish) from mineral oils.




## Electro-hydraulic drive systems EHC-A with mounted SIL-compliant hydraulic control block EHC-S

Refurbishment and modernisation of turbine control units

# Conservation of resources

The service life of the goods, materials and fluids used in the entire power generation process can only be guaranteed in the long time if they are considered as a whole, across the entire operating life.
It goes without saying that this can also help to increase environmental protection while reducing the operating costs.
For example, the longer service life for lubricants and hydraulic fluids in the power plant can often bring about cost savings of 30% and reduce the carbon footprint (producing just one litre of turbine oil creates roughly 700 grams $CO_2$).
As a specialist in fluid engineering, HYDAC can provide continuous online monitoring of your operating fluids (lubricants, hydraulic fluids) and, as required, process-controlled conditioning of these operating media with application-optimised cooling, filtration and fluid regeneration.

**1**

**Reconditioning of hydraulic and lubrication fluids**

- FluidAqua Mobil (FAM) used in a steam/ gas turbine's control hydraulic circuit in a power plant
- For hydraulic oil and lubricant (bearing, gear boxes) conditioning (dehydration and filtration)

**2**

**Modernisation**

- Retrofitted fine-filtration systems (OLF) ensure the desired cleanliness class of hydraulic and lubrication fluids is reached and extend maintenance intervals
- "Smart filtration" upgrades with integrated particle sensors (optional)

**3**

**Renovation**

- Combining the process water circuits (cooling water, seal water, extinguishing water) in modernisation tasks in the power plant
- Ensuring the cleanliness class is reached via process water filter systems in skid design

**4**

**Cost optimisation**

- Plate heat exchangers used in generator lubrication systems, turbine control hydraulics etc. also for retrofitting as cooler-filter skids
- Plate heat exchangers with protective filtration (coolant) to ensure consistent cooling capacity



# HYDAC products for conservation of resources in power plants

### Dewatering unit FluidAqua Mobil FAM

Undesirably high levels of process steam and process water enter the oil circuit, particularly in the lubrication oil systems of steam and water turbines.

This results in a rapid acceleration in fluid ageing and limited lubricity.
By using FAM dewatering and filtration units continuously during plant operation, integrated conditioning of the lubrication media is assured.

### OffLine Filter OLF

The OLF 15/30/45/60 series of filtration units are robust off-line filters for industrial applications in
hydraulic and lubrication systems with a large fluid volume.

The Dimicron elements used in these filters are noted for their particularly high contamination retention capacity and an environmentally safe method of disposal (incinerable).

### VarnishMitigating Unit VMU / VarnishElimination Unit VEU and Ion eXchange Unit IXU

The VMUs/VEUs are used to condition mineral oils. They are particularly effective at removing oil ageing products (varnish) from mineral oils. The removal of varnish is based on adsorption on an active surface.

The IXU series of ion exchange units is designed to condition fire-resistant hydraulic and lubrication fluids based on phosphate esters (HFD-R) and polyol esters (HFD-U).

They are effective in removing the acidic products of degradation resulting from hydrolysis and/or oxidation of the fluid as well as metal soaps present in the fluid.

### Cooling systems

Influence of temperature on fluid service life (a temperature increase of 10 °C, starting from 50 °C, reduces the oil service life by one half)

In particular for generators, electrical inverters and converters the oil/air cooling systems offer a cost-efficient performance ratio

# System availability

With our **Predictive Maintenance Program**, we can significantly help to keep your plants running smoothly.
High plant availability, with all costs taken into account, is vital for cost-effective and safe operation. For more than 20 years, this topic has been a major priority for HYDAC and has inspired an entire range of products aimed at realising this goal. On the basis of as-is analyses performed during operation, taking your production process into account, we can find the perfect improvements for your plant.
Additionally, you can use the recorded data to identify the condition of your plant and detect the level of wear or pending downtime, making it possible to perform condition-based servicing/maintenance in due time.

**1**

**Monitoring the contamination level**

- Installing ContaminationSensors (CS), ContaminationSensor Modules (CSM) in contamination-sensitive lubrication plants (turbine bearing lubrication, turbo transmission lubrication)
- Online data logging of lubricant contamination level

**2**

**Monitoring of water ingress**

- Installation of AquaSensors (AS) in water-sensitive lubrication and hydraulic systems (steam turbine control) in turbine bearing/ generator lubricating systems and gears
- Online data logging of the water content in lubricant or hydraulic fluid

**3**

**Filtration strategies**

- Redundant, switchable RFLD/AFLD filters in lubrication applications for turbine bearing oil supply and, as applicable, for the gears
- Modernisation of hydraulic and lubrication systems – inline filters with single pipes replaced by redundant, switchable double filters

**4**

**Fluid conditioning strategies**

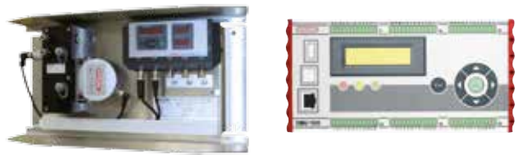
- The common formation of varnish (oil ageing deposits) in the oil of gas turbines and the resulting function problems for valves, oil filters and measurement equipment can be rectified with fluid conditioning units such as VEUs/VMUs



# HYDAC products for plant availability in power plants

**Fluid sensors (Oil monitoring)**

- CS series for recording cleanliness classes to ISO 4406 in sensitive hydraulic and lubrication circuits
- AS AquaSensors for recording relative saturation level in % of water in the oil and the temperature in sensitive hydraulic and lubrication circuits
- LAB sensors for recording the oil state (temperature, water, oil ageing)



**Fluid monitoring systems**

- Stand-alone data logger with display
- Interfaces and software to incorporate the sensors into the control room

**Non-fluid sensors**

- Pressure sensors, electronic pressure switches
- Flow measuring turbines
- Distance measuring systems for electro-hydraulic drives and hydraulic cylinders e.g. servo motors

**Fluid conditioning systems**

- For separating: particles, water, varnish, acids and gases from hydraulic and lubrication circuits (e.g. gas turbine lubrication systems)

**Gas and water filter systems**

- Water filters: to protect cooler and nozzle, for the treatment of flue gas ($NO_x$) and ash
- Gas filter: for seal gas filtration in compressor auxiliary application and fuel gas filtration in gas turbines or gas turbine packages

# HYDAC services packages for power plant operators

The HYDAC Servicenter, together with its service partners, offers a complete portfolio of services.
With more than 50 years of practical experience in hydraulic, lubrication and control applications in the power plant, we can offer targeted advice for pending service work. Furthermore, we can guarantee that you will be given the best service package for your application. Wherever you are, a fleet of service vehicles and a skilled service team is nearby and available at short notice for repairs, maintenance work and inspections.

**1**

**Worldwide service directly on location**

- Commissioning of fluid power systems
- Spare parts service
- Servicing, maintenance and repair of fluid power systems
- System optimisation

**2**

**Hydraulic accumulator service**

- Repair of accumulator bladders
- Inspection/retrofitting of gas safety valves
- Inspection/retrofitting of oil valves
- Safety inspection before commissioning
- Risk assessment/ specification of inspection intervals

**3**

**Training**

- Individual training modules for power plant operators and maintenance staff

**4**

**Partnerships and contracts**

- Framework agreements concerning the maintenance and repair of fluid-power systems



# HYDAC packages for service in power plants

**Service package: energy check**

- As-is assessment
- Rectification of energy defects
- Modernisation with energy-saving components and systems

**Service package: inspection service**

- Hydraulic accumulator service, accumulator inspections
- Support for servicing/maintenance schedules for your plants
- Safety strategy training
  - Risk assessment
  - Periodic tests for hydraulic accumulators
  - Inspection of safety devices

**Service package: modernisation service**

- Overhaul of your fluid-power systems (upgrades)
- Support for the commissioning of hydraulic and lubrication systems and provision of the required rinsing units, dewatering units and measurement equipment
- Individual assessment of the applications with the aim of reducing costs and increasing plant availability
- Spare parts management