



# Excellence in Pumps

for the Power Industry

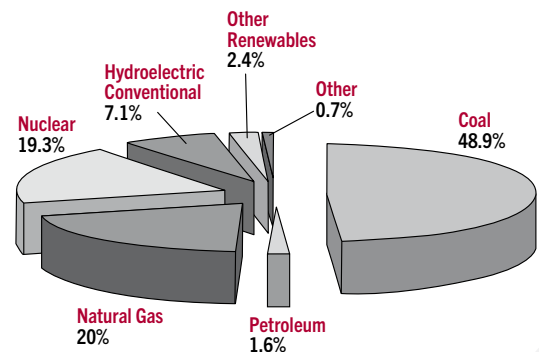
# FELUWA in the Power Industry

**E**lectric power is nowadays one of the most substantial and indispensable requirements of the modern age. The majority of electric power is generated by means of coal-fired power plants, through coal gasification or similar techniques. Worldwide coal deposits could sustain the current production rate for another 150 years.

Traditional transportation of coal to power stations by rail requires extensive infrastructure, equipment and energy. For this reason, many conventional facilities are replaced by environmentally friendly and economical pipeline transfer systems. Such hydrotransportation is typically implemented by heavy duty, high pressure positive displacement pumps, like FELUWA MULTISAFE® double hose-diaphragm pumps.

**I**n coal-fired power stations, inevitably large volumes of fly and bottom ash are generated as a result of the incineration process. This waste product is either used for the construction industry or transferred to ash ponds. Hydraulic piston pumps are typically applied for this duty.

In line with latest findings many conventional units are nowadays modified into dense ash pipeline disposal systems. FELUWA is not only a leading manufacturer and supplier of the relating pump technology, but likewise offers hydraulic design calculations of such pipelines.



FELUWA MULTISAFE® double hose-diaphragm pumps provide for the energy-efficient transportation of fly and bottom ash to the ash ponds at maximum concentration. This allows for quick solidification and recultivation. MULTISAFE® pumps are specified for low and high pressure duties within the power industry and have proven their outstanding reliability in hundreds of installations. For the handling of highly viscous slurries, pastes or products that tend to settle, the working principle of FELUWA MULTISAFE® pumps is literally turned upside down, which means that the flow is directed from the top to the bottom of the pump. The so called **downflow configuration** (see detailed description) avoids settling of heavy solids (such as bottom ash) within the pump. Both upflow and downflow configuration offer high reliability and availability at minimum cost of ownership.



FELUWA MULTISAFE® double hose-diaphragm process pump. One triplex unit (out of three) in a dense ash pipeline disposal system.  $Q = 150 \text{ m}^3/\text{h}$  each  $p = 80 \text{ bar}$

## Typical applications of FELUWA process and transportation pumps

### In coal-fired power plants:

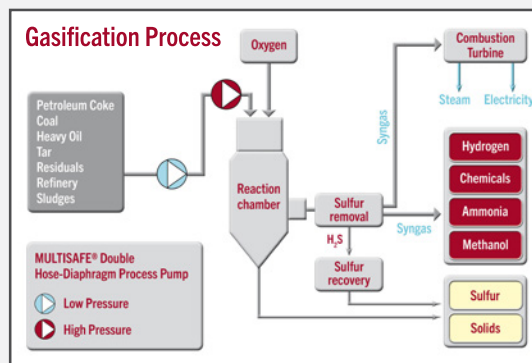
- Hydrotransportation of coal **to** power stations
- Dense ash pipeline disposal **from** power stations
- Feeding of lime milk and disposal of gypsum slurry in flue gas desulphurisation systems

### In coal gasification plants:

- Low pressure pumping of coal slurry from mill discharge to coal slurry tank
- High pressure feeding of coal slurry into gasifiers

# Coal Gasification Systems

A part from the traditional incineration of coal, modern power stations include coal gasification, coal liquefaction or even state of the art IGCC (Integrated Gasification Combined Cycle) systems. In the coal gasification process, coal is pulverised and mixed with water. The resulting coal slurry is then processed by both partial oxidation and gasification into a conglomerate of CO and hydrogen. To a large extent, the efficiency of coal gasification units depends on the availability and reliability of the pumps that feed the coal slurry into the gasifier. As a general rule, positive displacement pumps are used for this purpose. Apart from maximum availability, these units have to ensure minimum pulsation and maximum accuracy of the feed range. More than 80 % of worldwide gasifiers are fed by FELUWA double hose-diaphragm process pumps or hose diaphragm pumps, respectively.



Flow sheet of a typical gasification process with MULTISAFE® double hose-diaphragm pumps for low and high pressure duties.



Triplex sets of FELUWA MULTISAFE® double hose-diaphragm process pumps with double ball valve configuration feeding coal slurry at high pressure into a gasifier.

FELUWA has been selected by leading gasification technology manufacturers to supply gasifier feed pumps for their most prestigious power plants. On the one hand, this preference is based on FELUWA's established and long lasting experience in the field of gasifier feeding. The second criterion is based on the design advantages of FELUWA MULTISAFE® double hose-diaphragm pumps and hose diaphragm piston pumps that allow for maxi-

mum availability at minimum wear. In view of high overall efficiency, also in terms of energy, FELUWA process and transportation pumps are not only qualified for the high pressure feeding of the coal slurry into the gasifier, but also found to be equally profitable to convey the slurry at low pressure from the mill discharge tank into the coal slurry tank.

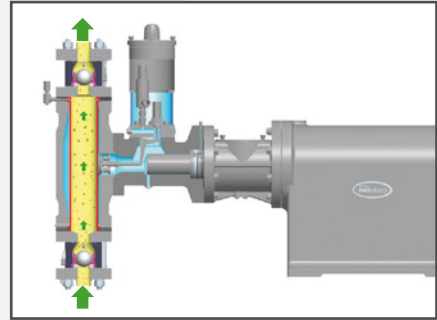
Most of FELUWA hose-diaphragm process pumps in coal gasification systems are of double-acting quadruplex design or single-acting triplex design. By this means, continuous slurry flow is ensured and sedimentation avoided in equal measure. The check valve design is another technological feature that is essential for gasifier feeding. The pumps are equipped with special double ball valves which in turn are designed with a metallic and an additional soft sealing, creating a double seal in a single valve. This combination has been developed based on the results from a series of experiments, which, by means of an elastomer seat insert, guarantee 100 % sealing efficiency and reduce wear to a minimum, regardless of obstructive particles in the media. A large variety of other valve designs is available as an option.

Coal Gasifier Feeding

FELUWA pumps are available for flow rates of up to 1000 m<sup>3</sup>/h and discharge pressures of up to 400 bar. They are characterised by unique design features in favour of the overall performance, reliability, availability and cost of ownership. Some of these features are:

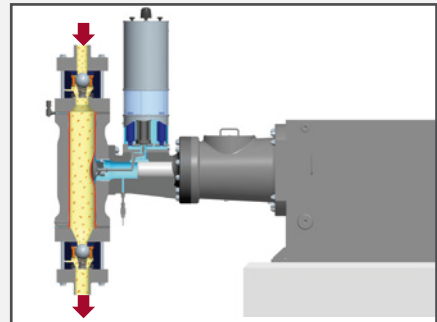
### FELUWA Double Hose-Diaphragms

At the heart of FELUWA MULTISAFE® pumps are two hose-diaphragms which are arranged one inside the other. They fully enclose the linear flow path of the product and provide for double hermetic sealing from the hydraulic drive end. The lifetime of hose-diaphragms is considerably extended beyond that of flat diaphragms. Standard materials are available for temperatures up to 200 °C.



### FELUWA DownFlow Technology (DFT)

For applications carrying solids that tend to settle and may cause breakdown of the pump resulting from blockages within the check valves, pump chamber or piping, FELUWA literally turns the traditional pumping principle upside down. By means of downflow configuration the flow is led from the top to the bottom of the pump. Sedimentation within the pump is thus reliably prevented.



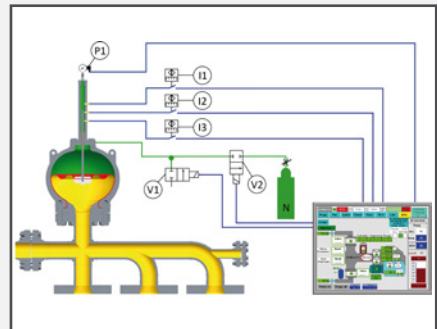
### FELUWA Double Valves and Quick Change System (QC)

Double valves with unique hydraulic clamping system (QC) are recommended for media with high solid content and applications which require a particularly high continuous flow. If, in the short term, a particle gets jammed between the ball or cone and the valve seat resulting in valve leakage, the second valve ensures effective sealing, thus preventing medium backflow and a resulting loss of volume.



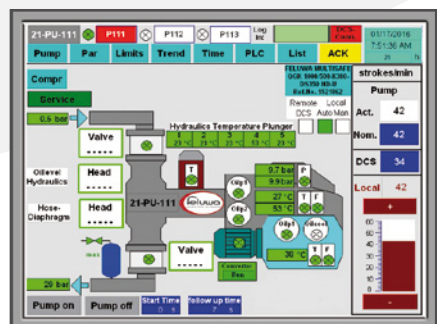
### FELUWA Pulsation Dampener PULSATROL

For applications with varying discharge pressures FELUWA provides systems with automatic adaptation of the gas volume within the PULSORBER. Integrated sensors detect the prevailing operating conditions and send signals to the control system for processing of the readings and adaptation of the gas volume. By this means optimum pulsation dampening is ensured throughout the entire pressure range.



### FELUWA WebGuard (FWG)

By means of diagnostic systems and touch panels, FELUWA offers a Human Machine Interface with full integration of pump diagnostics into industrial control systems and also a web-based service option. Permanent monitoring includes for example hose-diaphragms, check valves, inlet and discharge pressure, flow rate, speed, pulsation, hydraulic oil temperature, lube oil flow and pressure.



# About FELUWA



**F**ELUWA Pumpen GmbH has at its base in excess of 100 years company history. In 1901 the parent company was established in Neuwerk/Mönchengladbach as a foundry and expanded in 1931 by a machine factory, based in Cologne. After a short period of time, the company started concentrating on pump technology. In 1960, FELUWA moved to Mürlenbach in the Eifel area, because the considerably increased production line was calling for expanded manufacturing plants.

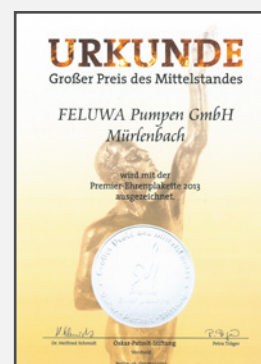
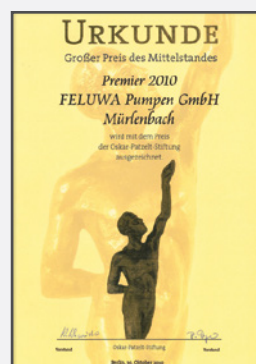
On 1st November 2000 FELUWA joined the ARCA Flow Group. For in excess of 80 years, ARCA Regler GmbH, whose headquarters are situated in Tönisvorst, has been one of the leading manufacturers of control valves, pneumatic actuators and positioners (including binary pneumatic output) and has been selected amongst the TOP 100 most innovative companies in Germany. With four production sites based in Germany, two in Switzerland as well as joint venture companies in India, Korea, Mexico and China the ARCA Flow Group operates worldwide.

Since 1931 FELUWA has been focusing on the design and development, production, sales and after-sales service of pumps for challenging duties, such as oscillating displacement pumps, waste-water pumps and sewage pumping stations.

The decisive lead in know-how is based on FELUWA's focus on pumps for solids-carrying, abrasive and aggressive fluids. Only those who specialise will be able to gain experience which is indispensable for actual state-of-the-art technology.

Today, FELUWA pumps can be found in operation throughout the world; in the heat of the Australian desert, in the icy cold of Antarctica, in endless Siberian tundra and on all the world's oceans. The growing demands for quality and safety are met in the same way as customers' wishes for an optimum solution to their specific materials handling problem.

The continuous process of innovation and development of FELUWA Pumps has been subject to multiple high-ranking recognition and awards.



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