

Case Study KSB Service GmbH / RWE Power AG

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Upgrading of Negative Safety Valves to Pneumatic Anticipatory Control Valves

Categories

1. Maintenance services
2. Plant optimization and modernization
3. Equipment and spare parts

Market Sector

Energy Industry, Utilities

Brief Description

- Risk analysis, project engineering and upgrading measures regarding six negative safety valves in the refuse-fired power plant Karnap / RWE Power AG.
- Construction of modern pneumatic safety valves.
- Maintenance services for the negative safety valves (main valve).
- Installation of new pneumatic control valves within a restricted timeframe of four days per safety station.
- Measures to reduce spare parts stockpiling.
- Upgrading of control cabinets to modern instrumentation and control systems.
- Compiling of technical documentation for the expert's report by RWTÜV.

Task

Execution of upgrading and engineering measures on negative safety valves and designing of pneumatic anticipatory control valves in co-operation with RWE Power AG/MHKW Karnap. Including a short downtime, the implementation of the new anticipatory control valves and upgrading of control cabinets was to be conducted within a timeframe of less than 4 days, as requested by RWE Power AG.

Preparatory

The refuse-fired power plant at Karnap, owned by RWE Power AG, had six negative safety valves installed. These safety valves were fitted with three anticipatory control valves, which protected the system against excess pressure. In accordance with AD 2000 (Technical Bulletin A2) this implied a safety selection one out of three. These anticipatory control valves were fitted with electrical eccentric slider-crank actuators and magnet plungers. Due to the long operating period of the plant the number of operational failures had increased during the last years considerably. Because of these disruptions and difficulties to procure spare parts RWE and KSB explored the possibilities of upgrading the system to modern anticipatory control valves. To safeguard plant operations the original control valves (electromagnetic controls) were examined and it was decided to upgrade the system to pneumatic anticipatory controls on the basis of the standard valves KSB Nori[®] 500. Decision-making included exploring the following points:

- Easy assembly of anticipatory control valves KSB Nori[®] 500.
- Long-time secure and efficient spare parts procurement.
- Comparably little time and effort on the piping system to install the valves.
- Control cabinet can be retained, simply exchanging the switchboard.
- Pressure line and pressure sensing line don't have to be changed.
- Order of monitoring devices does not have to be changed.
- Cost-efficient solution.
- Unaltered verifying function.

Implementation

Concerning plant availability and for securing spare parts procurement RWE Power AG opted for upgrading the negative safety valves by **KSB Service GmbH**:

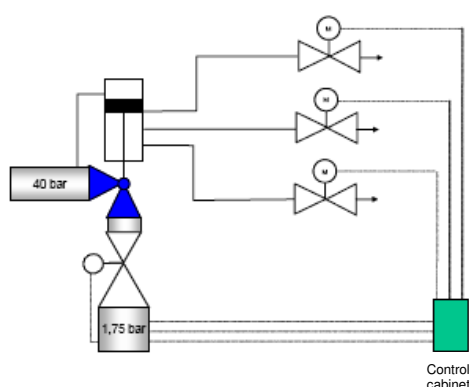
Operations included converting, designing, delivery, and installation of pneumatic anticipatory control valves. During the conceptual preparation and the conversion of the control voltage to 24V RWTÜV Essen was embedded in all decisions taken. After testing of the concept with regard to process engineering and electro technical engineering RWTÜV gave clearance for the upgrading measures on the negative safety valves control in accordance with TRD 421 and AD 2000 (A2 Technical Bulletin). In accordance with the clearance by RWTÜV the anticipatory control valves with safety functions were built by KSB. The modern anticipatory control valves were designed on the basis of standard valves KSB Nori®500. At the selection of adequate drives KSB SISTO piston-actuated drives with appropriate safety devices were implemented.

Description of upgraded safety devices

The negative safety valves concerned are type tested fittings type no. TÜV-SV-82-643, which operate on the principle of a depressurisation system as relief valves with steam as driving agent. To fulfil their safety position the steam-exposed area beneath the piston has to be depressurised.

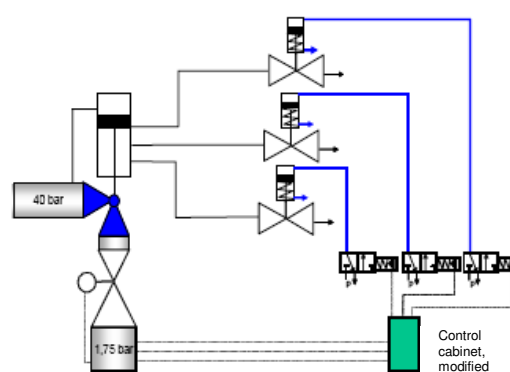
This is executed by independently operated pneumatic control valves. Each valve consists of the already mentioned fitting KSB Nori® 500 including attached pneumatic drives, opened by spring force and closed pneumatically. Normally the spring is tensed by the control air supply above the piston. The closed control valve maintains the pressure within the piston of the main valve, keeping the main fitting open. If the system pressure increases and reaches the actuation pressure of one of the three pressure switches, the respective magnetic valve in the control leg of the pipe system responds, releasing the control air pressure from the pneumatic control system's piston, opening the control valve, discharging the vapour pressure in the main valve's piston, and closes thereafter. The position of the pneumatic control valves is monitored by positioning limit switches.

The installation of the pneumatic control valves was conducted during a downtime of the complete plant. At the same time in the course of system maintenance the main valve was checked closely to detect possible damages. Also, the plant operator fielded a secure air supply system for the pneumatic anticipatory controls. Electrical and process engineering for integration of the devices into the control system were executed in close co-operation with RWE Power AG.



Configuration diagram before upgrading

Main valve with old control system based on eccentric slider-crank mechanism with magnet plunger

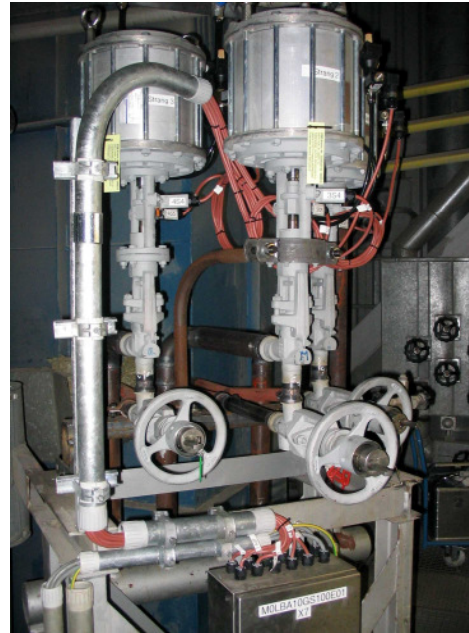


Configuration diagram after upgrading

Main valve with new pneumatic controls and modified control cabinet

Before

Original condition of the main valve with conventional control valves

After

After upgrading with modern, pneumatic anticipatory valve controls KSB Nori[®] 500

After implementing the new anticipatory control valves the switch board in the control cabinet was upgraded. Here the impulse lines were changed and controls adjusted from 220V(G) to 24V, and, finally, a functional analysis was conducted.

Comparable to prototype technical release testing following TÜV•SV•82-643 standard procedure RWTÜV/Eszen issued a certificate of conformity.



Conversion of control cabinet to 24 V

Upgrading of the safety controls met 100% of all requirements by TRD 421 and AD 2000 (A2 Technical Bulletin). Commissioning of the plant was therefore approved by RWTÜV/Eszen. This special certificate is part of the upgrading measures and functions as a pilot plant for other plants needing upgrading in the future.

In the meantime, five out of six negative safety valves have been upgraded to pneumatic anticipatory control valves, and sufficient operating experience has been made by the plant operator.

These results and the conspicuously lower maintenance costs made the plant operator judge on the upgrading of negative safety valves to pneumatic anticipatory control valves as economically highly advantageous.

Last but not least, it should be mentioned that without the outstanding co-operation offered to the contractor by the plant operator the process would not have come about so smoothly.

(Source: Volker Wurzer, Engineering, KSB Service GmbH)

- Customer's Benefit**
- Optimisation of technical complex special fittings and stations.
 - Increasing availability of plant operations and increasing plant safety.
 - Lowering of maintenance costs.
 - Optimisation of spare parts stockpiling.
 - Retention of existing peripheral equipment and testing operations.

Ordering Party

RWE Power AG, subsidiary of the RWE Group founded in 1898, is Germany's largest utility and a leading European company with regard to power generation from a broad range of primary energies. The core business comprises power generation from nuclear energy and lignite produced in the Company's own opencast mines in Rhineland for base load; hard coal, gas and renewable energies like water, wind and biomass for mid-merit and peak load. With its highly diversified energy mix and a sound financial basis, RWE Power with its 15.000 employees has made use of its chances in a liberalised energy market. RWE Power deals within a highly competitive market, offering its customers power supplies which are reliable, reasonably priced and environment-friendly. RWE Power's objective is to be a leading national and international utility and to continue to shape the future of energy supplies in a leading role. RWE Group posted a turnover of € 42 billion in 2005.

Internet: <http://www.rwe.com>

Contractor

KSB Service GmbH is the services subsidiary of KSB AG, founded in 1871 and today a global manufacturer of pumps, valves, and custom-made all-in-one solutions for the areas of industrial applications and water technology, energy and facility technology. World-wide, more than 1,600 service specialists take care of the complete life-cycle of products – rotating equipment and valves – to enable their continuous availability. KSB offers custom-made service solutions for assembling and commissioning equipment, furthermore maintenance and repairs, even offering complete overhauls, upgrading and integrated service packages, on request at a fixed price. Service certificates for power plants (KTA) and industrial processing plants (SCC**) are most important safety operations issues. In the year 2005 KSB AG had 13,000 employees and posted sales of € 1.39 billion.

Internet: <http://www.ksb.de>

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Maintain 2006

The 2nd International Trade Fair for Industrial Maintenance will be staged from October 17th to 19th, 2006 at the M,O,C, trade fair centre in Munich. As MAINTAIN is the only specialized international trade fair for industrial maintenance in the world, it gives visitors a look at the latest trends in all sectors and furnishes them with information about state-of-the-art solutions that can be used to repair, maintain, inspect and improve their production facilities. For decision-makers and experts, that makes it the most important business gathering that deals with all aspects of industrial maintenance. Special fora on maintenance as a core factor for production and up-to-date information on MAINTAIN's web pages add to the event itself.

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