

## VAG Anti-Surge Pipe Protection

The most economical solution to prevent water hammer



# VAG Anti-Surge Pipe Protection

## General problem

In case of a pump shut down or after a power failure, the pump will stop immediately, but the water column remains the same due to its physical mass (inertia). This creates a vacuum behind the pump discharge outlet. After a while, the water column stops and starts the reverse flow, highly accelerated by the considerable forces of the vacuum.

This results in a fast back-flow which is suddenly stopped by the free swinging non-return valve and creates violent and dangerous water hammer which can destroy the pump and the valves, and also cause dangerous pipe bursts.

To prevent this problem, the consulting engineers have developed different possibilities of preventing this serious problem by planning and designing relatively expensive anti-water-hammer facilities such as surge vessels, equilibrating tanks, water relief valves, suction lines etc.. All these solutions make sense, but they are expensive.

## Conventional methods

There are a couple of conventional anti-water-hammer solutions, e.g. surge vessels, equilibrating tanks, water relief valves and suction lines around the pump.

### Surge vessels:

In the pump discharge line, behind the free swinging non-return valve, a surge vessel is connected to the main pipeline. Surge vessels are partly filled with water and air, where the air is constantly maintained under a defined pressure. In case of a vacuum occurring in the main pipeline, the water from the tank is pressed into the main pipe, thus balancing the vacuum and closing the non-return valve.

### Suction line:

With this method a bypass around the pump is connected with the suction side of the pump. A non-return valve prevents the backflow during normal operation. In case of a power failure, the vacuum draws off the bypass water from the suction side of the pump to equalise the dangerous negative pressure.

There are some more methods practiced all over the world to prevent water hammer effects, but all of them have major disadvantages: They are very expensive, require considerable planning and time expenditure and need frequent maintenance.



Surge vessel under operation of the pump

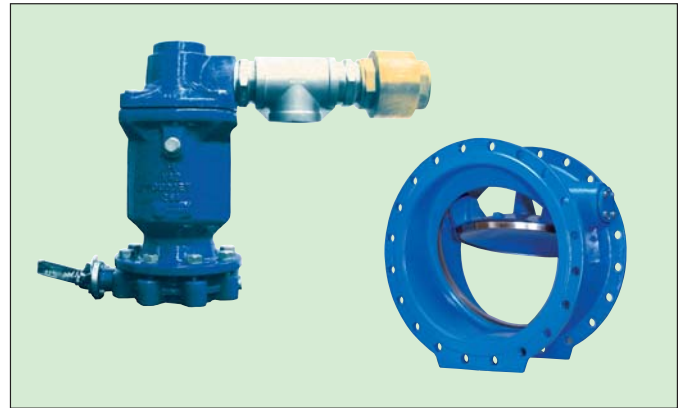


Surge vessel after a pump failure; the water equalises the vacuum

# VAG Anti-Surge Pipe Protection

## VAG Solutions

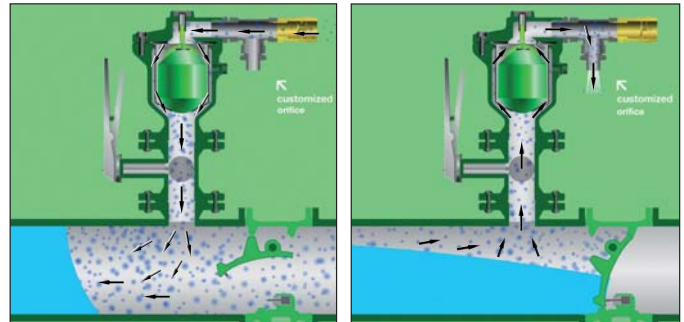
The VAG DUOJET® Anti-Surge Air Valve works according to a principle which allows a predetermined back-flow velocity in the main pipe. The perfectly adjusted orifice in the discharge outlet of the DUOJET® Anti-Surge Air Valve guarantees a defined back-flow velocity so that the maximum pressure rise according to the Joukovsky equation is not higher than e.g. 2 or 3 bars. This can be ensured by the perfectly adjusted orifice plate in the VAG DUOJET® Anti-Surge Air Valve which is specially designed and carefully selected to match each single application. It may sound unbelievable, but with this solution system, consisting of a VAG SKR Slanted Seat Swing Check Valve and the VAG DUOJET® Anti-Surge Air Valve, you can dispense with the costly conventional water hammer protection methods.



VAG DUOJET® Anti-Surge and VAG SKR Slanted Seat Swing Check Valve

## Working Principle

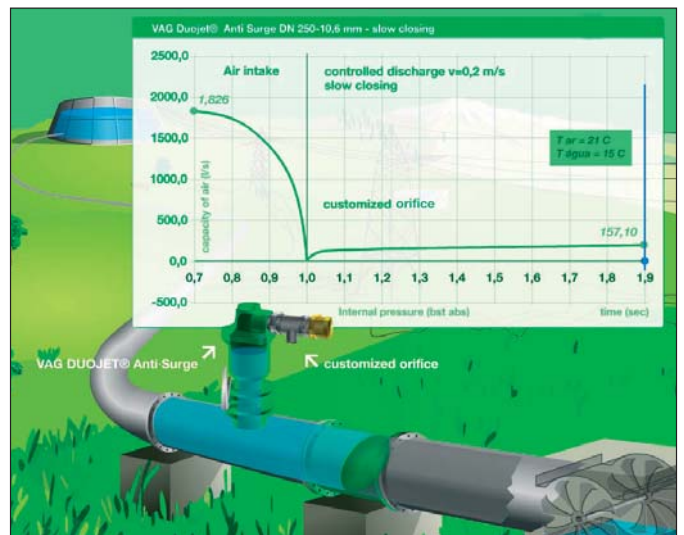
This water-hammer solution system is in each single case a custom-made and specifically designed solution to prevent uncontrolled water hammer rise in pumping stations and pipelines, where water column separation can be expected. Also, due to its well designed software-based evaluation, it is a perfect solution to fill pipelines under a controlled and safe velocity. Irrespective of the pump flow rate, it allows a filling velocity of the pipeline which is calculated according to the existing rules.



## VAG Solution - Anti-Surge Pipe Protection



The VAG solution: After a pump trip / shut off, air equalises the vacuum which has developed



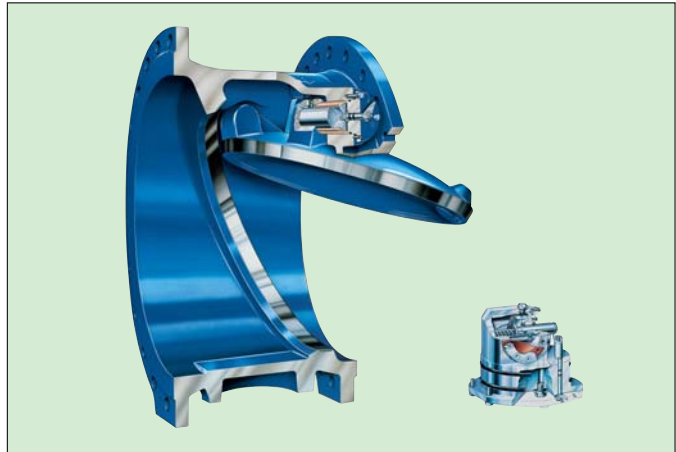
Controlled air release to minimize surge effects

# VAG Anti-Surge Pipe Protection

## Customer's advantages

### VAG SKR Slanted Seat Swing Check Valve

- Compact design, little space required
- Flow controlled free swinging into open and close position
- No external shafts, therefore no friction of respective sealing parts
- No levers or weights, therefore no dangerous striking movements in the operational area
- Damping characteristic is harmonised with dynamic behaviour of the valve disk. Thrusts will be absorbed where occurring, therefore no mechanical transmission to outside equipment required.
- Soft contact between valve disk and damping unit, therefore shock-free closing of the disk
- Damper unit can be retro-fitted without dismantling the valve from the pipeline; damper unit can be dismantled for maintenance



### VAG DUOJET® Air Valve

- Compact design, little space required
- Higher performance than double-chamber air venting valves
- Only few single parts
- No non-ferrous metals - unlimited application fields
- For anti-surge applications with a special customised orifice blend



### VAG Spring-Loaded Air Valve

- Intake of big air volumes in case of pipe break and to equalize vacuum
- Friction cylinder prevents abrupt closing of the disk



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