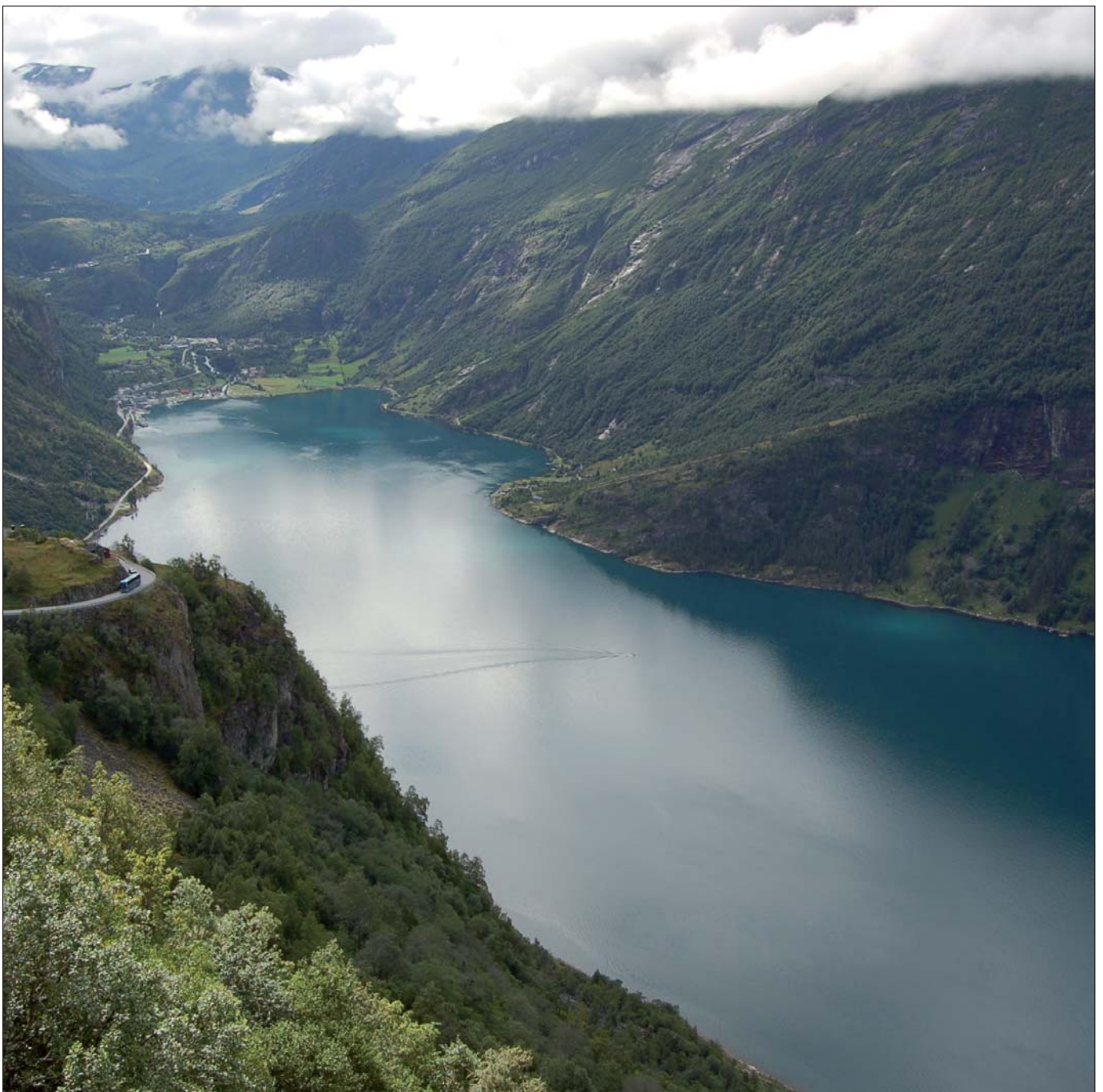




## VAG Valves for Hydropower Plants

For the turbine and by-pass, all Valves from one hand



# VAG Valves for Hydropower Plants

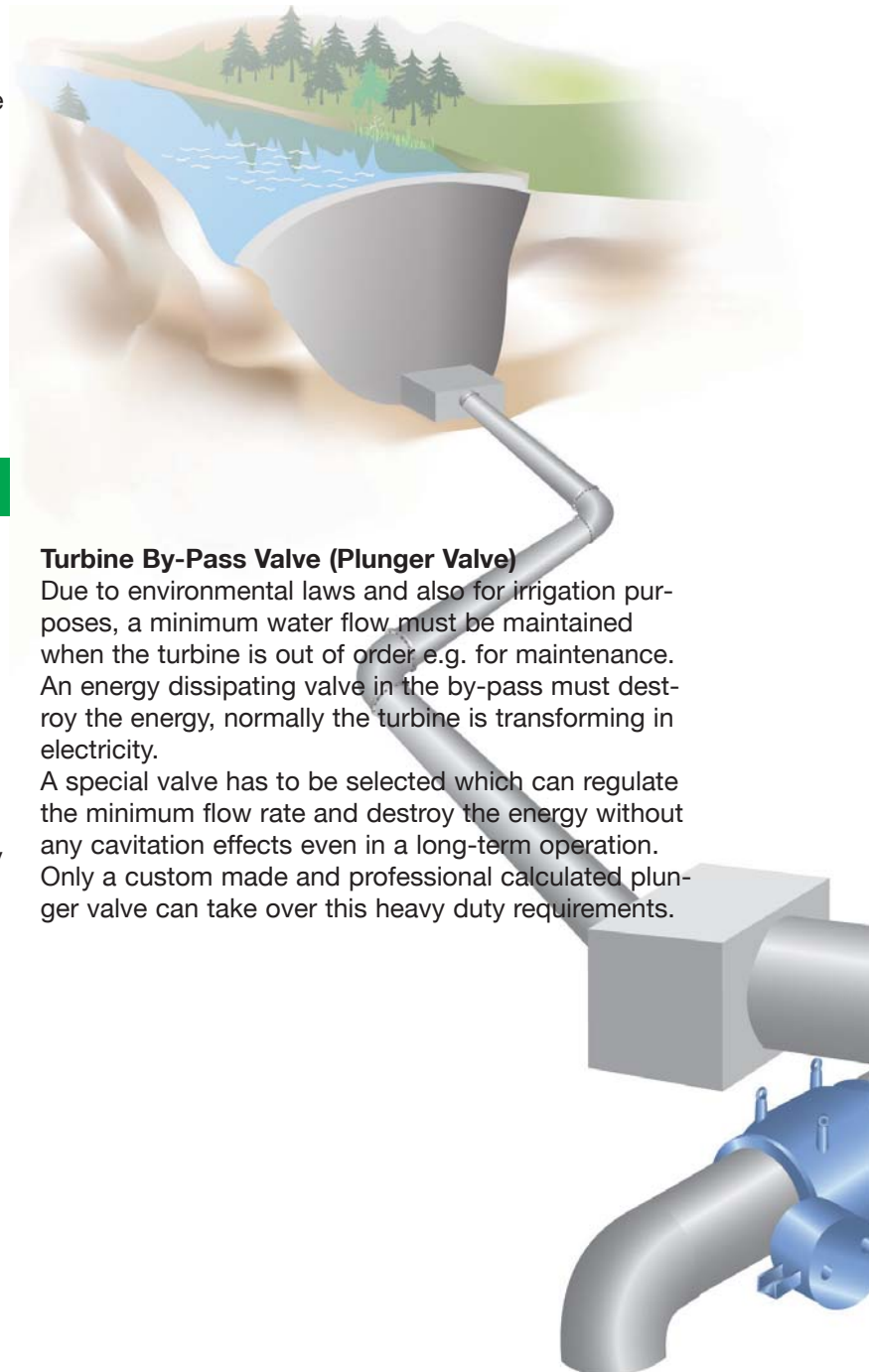
## Hydropower plant function

Actually, hydroelectric and coal-fired power plants produce electricity in a similar way. In both cases a power source is used to turn a propeller-like piece called a turbine, which then turns a metal shaft in an electric generator, which is the motor that produces electricity. A coal-fired power plant uses steam to turn the turbine blades; whereas a hydroelectric plant uses falling water to turn the turbine. The results are the same.

The theory is to build a dam on a large river that has a large drop in elevation. The dam stores lots of water behind it in the reservoir. Near the bottom of the dam wall there is the water intake. Gravity causes it to fall through the penstock inside the dam. At the end of the

gravity line there is a turbine propeller, which is turned by the moving water.

The shaft from the turbine goes up into the generator, which produces the power. Power lines are connected to the generator that carry electricity to your home and mine. The water continues past the propeller through the tailrace into the river past the dam.



## Valves in Hydropower plants

### Turbine Main Intake Valve (Butterfly Valve)

For start up and shut down the turbine, a very robust and reliable Valve at the intake-line has to be selected. Normally a double eccentric Butterfly Valve with hydraulic cylinder with lever and weight is used at that place.

#### Closing

For the closing movement an electromagnetic valve in the hydraulic control circuit will be activated, so that the lever and weight will close the butterfly valve safely and smooth without creating any dangerous water hammer.

#### Open

To open the butterfly valve a hydraulic cylinder at the valve is used which is powered by the hydraulic oil pressure coming from the turbine aggregate.

This valve has to withstand a very height gap flow velocity during the start up and shut down procedure of the turbine, as well as to work with the lowest friction loss in the fully open position to give the turbine the maximum efficiency.

### Turbine By-Pass Valve (Plunger Valve)

Due to environmental laws and also for irrigation purposes, a minimum water flow must be maintained when the turbine is out of order e.g. for maintenance. An energy dissipating valve in the by-pass must destroy the energy, normally the turbine is transforming in electricity.

A special valve has to be selected which can regulate the minimum flow rate and destroy the energy without any cavitation effects even in a long-term operation. Only a custom made and professional calculated plunger valve can take over this heavy duty requirements.

# VAG Valves for Hydropower Plants

## VAG Solution



### Turbine Main Intake Valve

VAG EKN® Butterfly Valve DN 500 PN 25 with hydraulic cylinder with lever and weight used as inlet valve for a turbine.



### Turbine By-Pass Valve

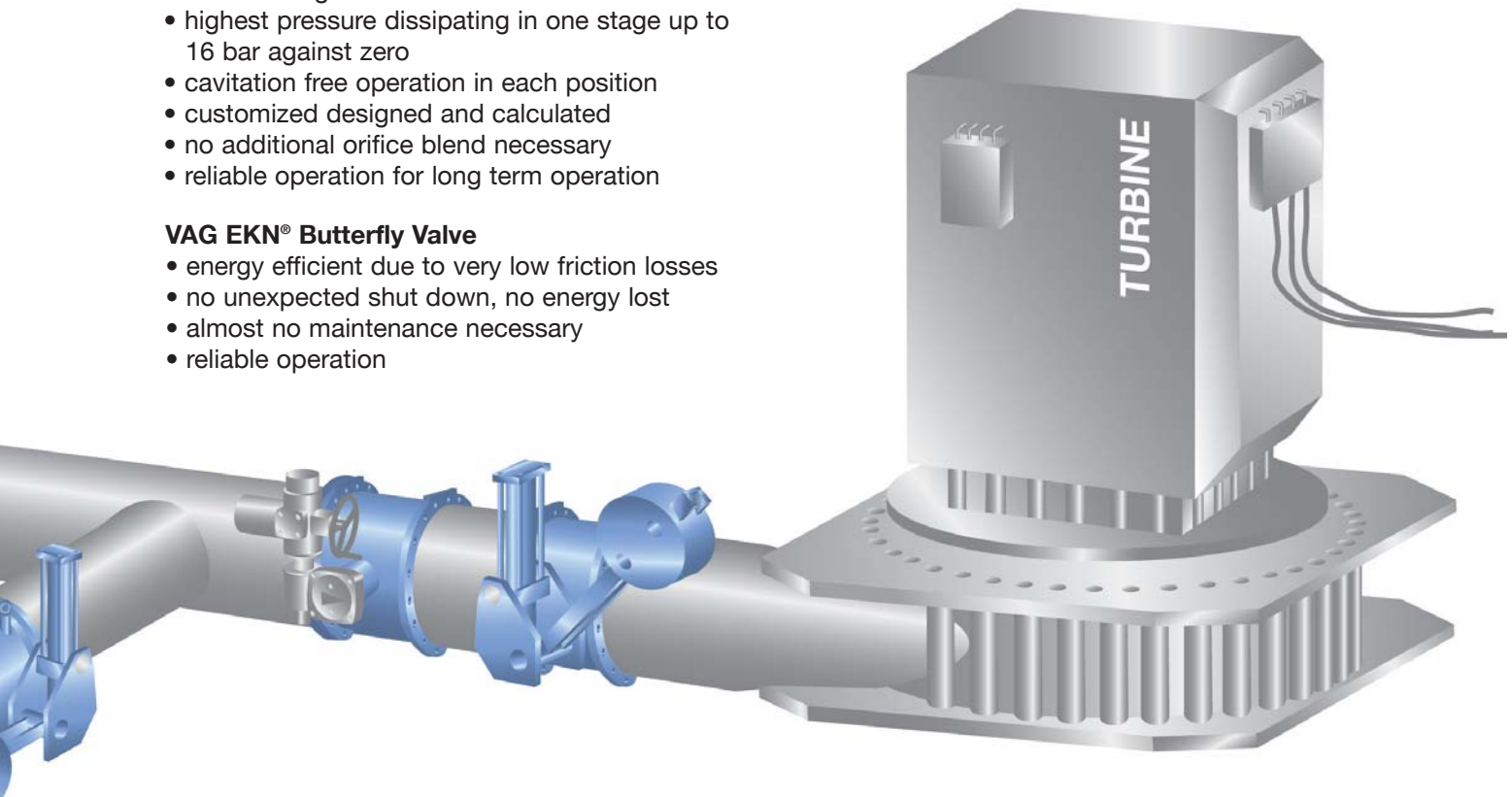
VAG RIKO® Plunger Valve DN 500 PN 25 in the by-pass of a hydropower Plant in Norway.

### VAG RIKO® Plunger Valve

- robust design
- highest pressure dissipating in one stage up to 16 bar against zero
- cavitation free operation in each position
- customized designed and calculated
- no additional orifice blend necessary
- reliable operation for long term operation

### VAG EKN® Butterfly Valve

- energy efficient due to very low friction losses
- no unexpected shut down, no energy lost
- almost no maintenance necessary
- reliable operation

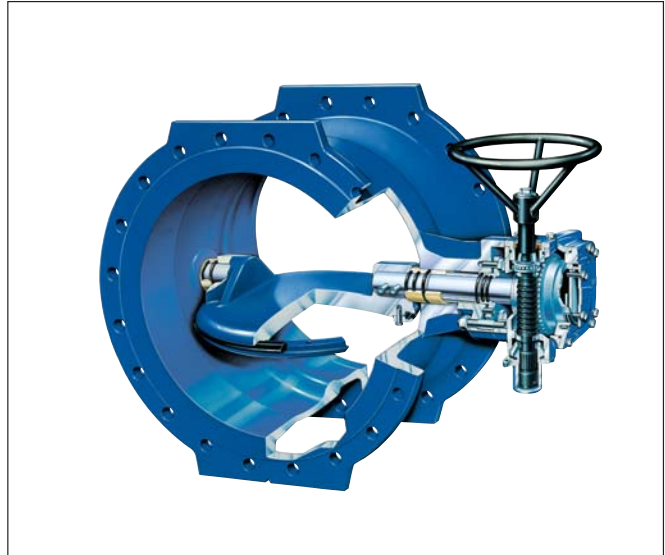


# VAG Valves for Hydropower Plants

## Advantages

### VAG EKN® Butterfly Valve

- Double excentric bearing of the disk, medium free
- Butterfly disk shape optimised by use of computer analysis
- Pressure supported sealing system, sealing ring can be replaced in open position
- Low friction loss
- Low operation forces



### VAG RIKO® Plunger Valve

- Variable flow-through characteristic, adjustable to the plant's characteristic
- Low risks of cavitation due to customized designed outlet parts
- Long service life of the sealing system, tight shut-off
- Low operation forces due to pressure relieved plunger piston
- Corrosion-resistant fully enclosed shaft bearing, medium free
- Piston guides is armour-coated with bronze absolutely corrosion safe



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