

## Francis : Ossberger

- A part-load operation with Francis turbines is not so much efficient
- A part-load operation with Francis turbines may result in cavitation
- A part-load operation with Francis turbines may result in vibrations.

Looking at the above topics, the following advantages may be expected for the project with an OSSBERGER Turbine:

- The hermetically closing guide vanes will be sufficient for a shutdown of the plant. i.e. one may do without any sluice gate in front of the turbine or the guide vane in front of the turbine is sufficient for manual actuation.
- To make sure a reliable emergency shutdown storage weights have been foreseen.
- No DC current feeding is required for an automatic plant operation.
- There is no stillstand, neither caused by an obstructed runner (for the self-cleaning effect of the Ossberger runner) nor by small flow rates.
- Creeping ageing, e.g. due to material abrasion at the runner as it is customary with reaction turbines, is unknown with OSSBERGER turbines. Thus the efficiencies of the OSSBERGER Turbines will still be the same even after decades of permanent operation.
- With the Ossberger system there is no cavitation risk at all.
- As there are no thrust bearings a simple lubrication system will be sufficient.
- The civil works required are utmost simple. In the turbine house an even floor with a rectangular opening above the discharge canal will be sufficient. The whole machine unit is lodged in a dry room clearly and with low space requirements and is well accessible from all sides.
- Routine maintenance can be made during operation.
- Maintenance requirements are negligibly small.
- The incoming flow can be regulated over a wide range on a permanent efficiency level.
- This will allow for the selection of a bigger design flow than with Francis Turbines, with an essentially higher annual production.
- Proverbial simplicity (two or three movable elements only).
- Standardised self-aligning roller bearings are used as main bearings, situated outside the water flow. Thus no lubricants are admitted to the water, moreover an exchange against standardised parts is permitted.