OSSBERGER

The OSSBERGER Crossflow Turbine - the Original

developed by Fritz Ossberger


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The past and the present

Modern by tradition

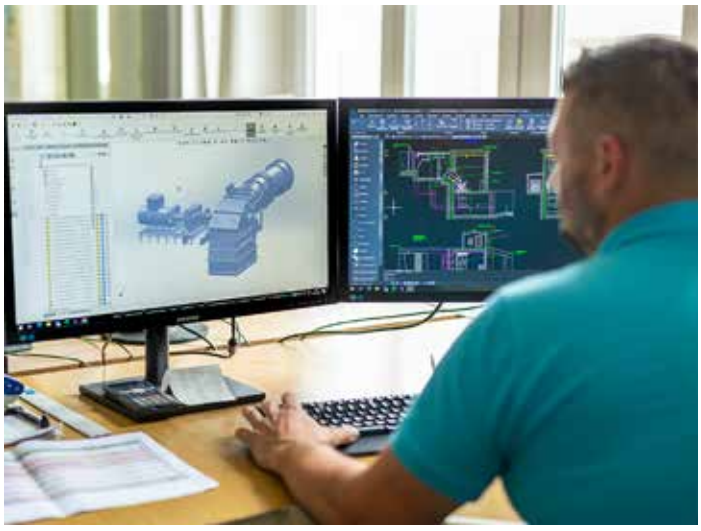
The name Ossberger has stood for quality, innovation and competence in mechanical engineering since 1873.

Fritz Ossberger, who founded the OSSBERGER Hydropower Technology division in 1906, worked continuously on the development of the free-jet turbine, was granted numerous patents and along with the Australian Michell and the Hungarian Banki, is one of the fathers of the Crossflow turbine, which is globally renowned and well-established in small hydropower today.

His legacy is being carried on into the fourth generation of the family today.

Facts

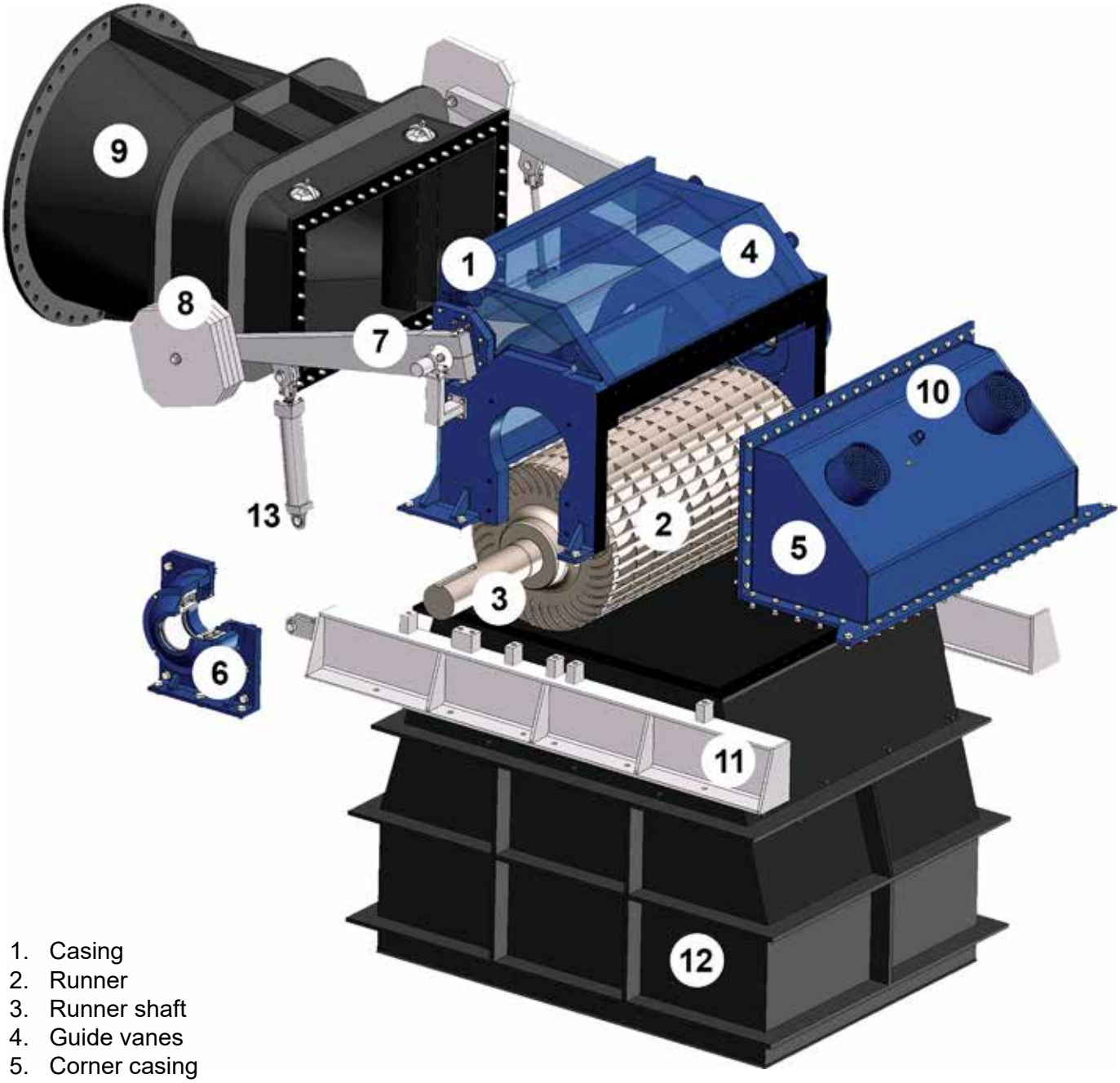
Hydropower Technology since 1906
Developer competence
Power plants up to 10 MW
Water-to-wire
More than 10,000 turbines installed
Satisfied customers in over 100 countries
Representatives in more than 50 countries



The OSSBERGER Crossflow Turbine - the Original

Range of application

- Outputs from 10 kW up to approx. 6 MW
- Heads from 4 to 200 m
- Water flows from 50 to 17,000 l/s



1. Casing
2. Runner
3. Runner shaft
4. Guide vanes
5. Corner casing
6. Self-aligning roller bearing
7. Lever arms
8. Counter weights
9. Straight reducer
10. Suction valve
11. Base frame
12. Draft tube
13. Servomotor

The OSSBERGER Crossflow Turbine - the Original

The Crossflow turbine is a radial and partially admitted free-jet turbine which due to its specific speed is classified as a low-speed turbine.

The special feature of the Crossflow turbine is its ability to process varying water flows with consistently high efficiency. It achieves this by division of the guide vanes into two cells, which automatically open or close independent of each other.

Design and Functionality

1. Casing

The welded steel construction is unsurpassed in robustness and durability.

2. Self-cleaning runner

The drum-shaped impeller blades are supported by multiple intermediate discs, providing high rigidity and preventing vibration. The water jet enters on one side of the runner and exits on the other, automatically flushing out foreign bodies. Clogging therefore does not occur.

3. Runner shaft

It is sealed with a simple, adjustable gland construction.

4. One- or two-cell guide vanes

The subdivision of the guide vane enables the processing of widely varying water flows without accepting big losses in efficiency. If only the small cell is opened, the turbine delivers profitable energy even with the smallest amounts of water (from 5 %). From approx. 17 % of the design full flow admission, the turbine runs within the guaranteed efficiency range.

5. Corner casing

It is removable and thus allows easy access to the runner for ease of maintenance.

6. Main bearing

The standardised spherical roller bearings can be removed in radial direction without special tools. Thanks to their positioning outside the water, no grease can get into the drive water. They require very little maintenance.

7. Lever arms

They regulate the two cells of the guide vane independently of each other.

8. Counter weights

These ensure emergency closing independent of external energy.

9. Straight reducer

It connects the rectangular turbine housing to the round pressure pipe without leakage.

10. Suction valve

It controls the vacuum in the turbine housing and makes the suction water column controllable. This allows optimum use of heads as low as 2.50 m.

11. Base frame

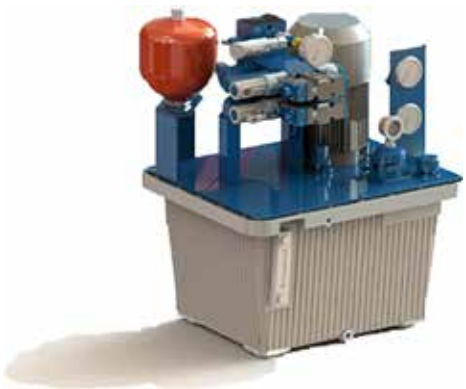
It provides the connection between the turbine and the foundation and enables fast and safe installation.

12. Draft tube

In order to make best use of the total head without losses, a draft tube is usually used for turbines with a head of less than 40 m.

13. Servomotors

They move the lever arms and thus control the opening of the guide vanes.



Benefits of the OSSBERGER Crossflow Turbine

Technical superiority

- Processing of highly variable water flows at a consistently high efficiency level
- Exploitation of the entire head by the use of a draft tube
- Superiority of the original: Imitation Crossflow turbines have inferior standards in operating and control behaviour as well as in efficiency curve, outputs and operational life
- As the runner does not cause axial thrust, the bearing requires little maintenance
- Proverbial simplicity (only two or three moving parts)
- Closing weights for safe emergency closing (no external power required)
- Simple adjustable shaft seals (stuffing boxes)

Cost savings

- Low construction work: only level concreted surfaces are required
- Quick and easy installation
- Minimal maintenance: regular lubrication and annual grease change, no need for special tools
- Machine set easily accessible from all sides
- No enforced standstill due to a clogged runner (self-cleansing effect)
- Higher output yields even on small water flows
- The tightly closing guide vanes are sufficient to shut down the plant, i.e. an automatic valve in front of the turbine can be omitted

OSSBERGER quality

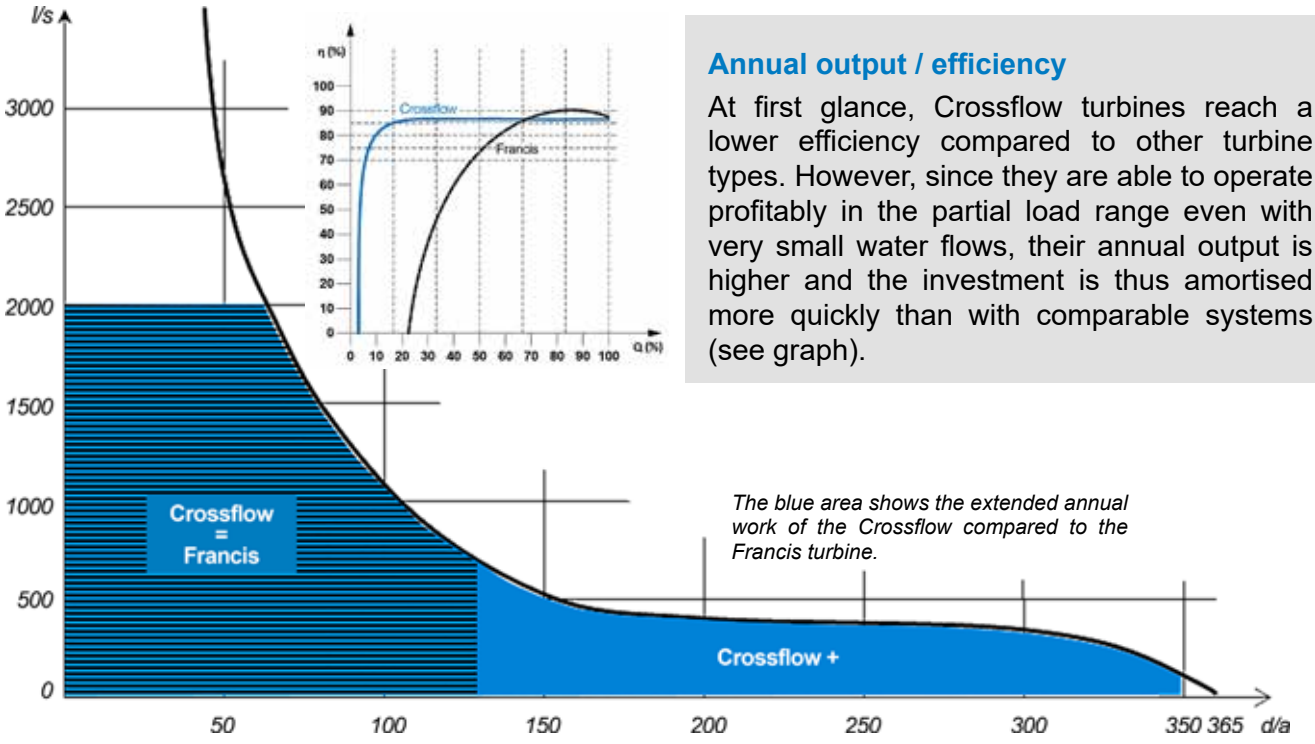
- Calibrated and hydraulically perfected guide vanes for vibration- and cavitation-free operation at high efficiency levels
- Durable industrial components, no short-lived electronic modules
- Maintenance-free guide vane bearings
- Best manufacturing quality “Made in Germany”

Ecological benefit

- Better oxygenation of the water than with other turbine types (scientifically tested) for greatest biodiversity benefits
- Minor impact on nature thanks to comparatively small construction measures
- No contamination of the water by lubricants

Annual output / efficiency

At first glance, Crossflow turbines reach a lower efficiency compared to other turbine types. However, since they are able to operate profitably in the partial load range even with very small water flows, their annual output is higher and the investment is thus amortised more quickly than with comparable systems (see graph).



The blue area shows the extended annual work of the Crossflow compared to the Francis turbine.

Application areas

The areas of application for the Crossflow turbine are diverse. They are ideal for run-of-river power plants, but also for water management and process water.

Run-of-river power plants

The division of the guide vane into two sections makes the Crossflow turbine extremely flexible in processing highly varying water flows, which makes it ideal for use in natural bodies of water where water flow fluctuates seasonally. The comparatively small construction measures also interfere far less with natural conditions than is the case with other turbine types.

Water management and process water

Water management tasks are also among the possible applications of the Crossflow turbine. These include, among others:

- Flow rate control
- Residual water dotation
- Sewage treatment plant outfalls
- Drinking water plants
- Water management and flood protection

In the service water sector, the turbines serve to generate energy on the one hand, and on the other hand to regulate the flow rate, e.g. in::

- Irrigation systems
- Base outlets at dams
- Canal gates
- Cooling systems of conventional power plants
- Seawater desalination plants

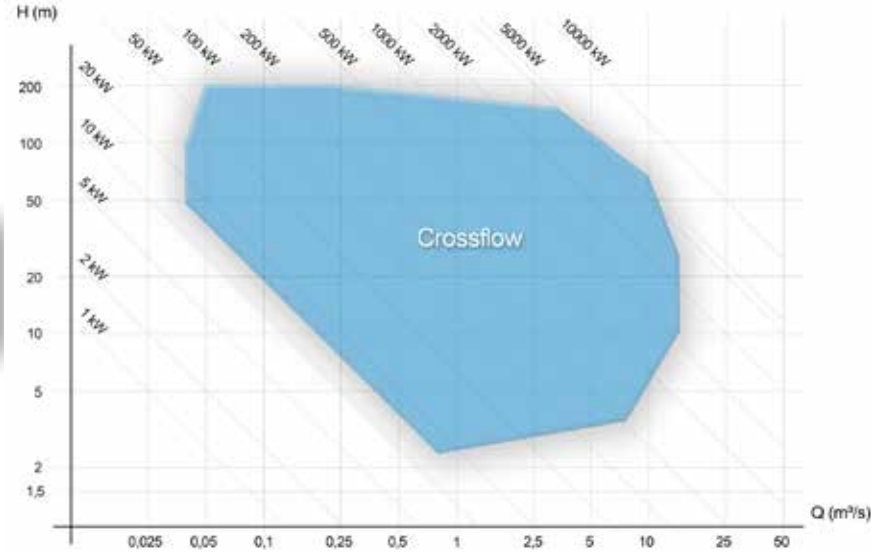
Operating modes

In off-grid operation, the Crossflow turbine supplies electricity to a specific group of consumers and easily adapts to their constantly changing needs. The turbine is controlled by an automatic speed regulator that keeps frequency and voltage constant. This operating mode often makes an important contribution to economic development in rural regions.

In grid-parallel operation, the electricity is fed directly into the public grid and remunerated according to national rules. The regulation takes place via the water level and the corresponding opening of the guide vanes.

With the combination of both operating modes, the electricity not used in isolated operation is sold into the public grid.

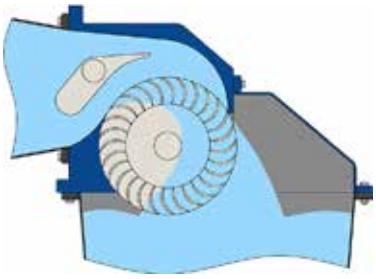
H = 4 - 200 m
Q = 0,04 - 17 m³/s



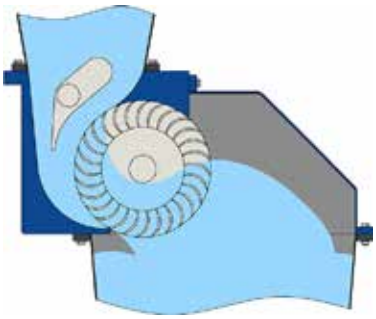
Materials

Depending on the area of application and the requirements placed on the material (mechanical or chemical stress, drinking water, salt water, etc.), various materials are used, while bearing cost optimisation in mind. These are:

- Carbon steel
- Stainless steel V4A
- Wear-resistant steel (e.g. Hardox)
- Superduplex



horizontal inflow



vertical inflow

5-axis milling centre

Runner assembly

The OSSBERGER product range

Hydropower plants up to 10 MW: Crossflow turbines, Kaplan turbines
Trash rack cleaning systems - also for large hydropower plants
“OTmation” automation systems

For a detailed offer and information on our other products, please contact us.

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