

Grüß Gott,
we're Erlach & Erlach.
We proudly present
the first ever up to
Six Jets Horizontal
Pelton Turbine.

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Introducing the New Horizontal Pelton Design

The new concept allows us for the first time to combine not only the advantages of a vertical turbine with those of a horizontal one, but also to incorporate further effects discovered and validated during testing:

The new design offers:

- Increase of power density by the factor of the number of additional nozzles
- Cost reduction due to these factors:
 - + At given data (Q , H) a higher rotation speed can be selected; therefore, cost intensive components like the runner and generator can be reduced
 - + The general size of the unit can be reduced
 - + The construction of the building and cavern can be reduced
- Higher performance, especially at full load
- Flat turbine characteristic, therefore better annual year production

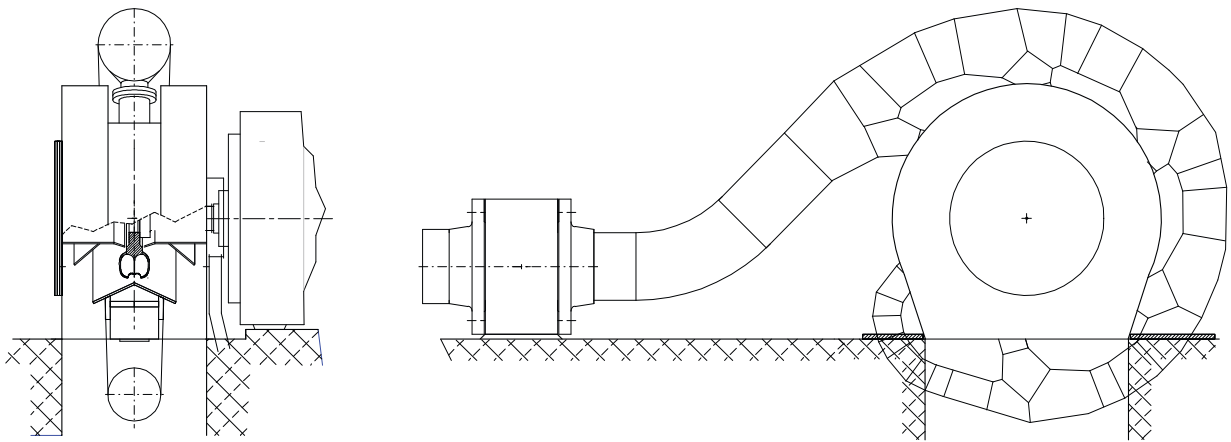


Fig. 1: Configuration with conventional distributor (six jet nozzles)

So, if the New Pelton Design is the solution, what was the problem in the first place?

Spray water! **State of the art** Pelton turbines fit the nozzles in such a way that the main splash water outflow is directed downwards to the channel. Outflow from the buckets of the runner in upwards direction can reflect on the housing and partially hit the runner, causing a strong decrease of power output. To give enough time to dewater the buckets, the needed angle of the gap must be at least 60, or better 70–90 degrees. Turbines with one and two nozzles do meet these requirements. Machines with three nozzles already make unfavorable compromises between the hydraulic demand – the angle of the gap – and the configuration of the housing to avoid spray water interferences. More than three nozzles are currently not possible!

New concept: This problem is solved with spray water rings, which are now strongly guiding the complete outflow. These rings are designed to prevent foam and residual splash water to hit the runner and reduce the power output. Now, the nozzles can be fitted in any desired gap angle, only following the optimal hydraulic demand of the runner. A three-nozzle turbine for example can have a gap angle of 120 instead of a less favorable 70 degrees, hence upgrading the efficiency. Horizontal turbines with up to six nozzles can now be realized.

A conventional Pelton turbine in vertical or horizontal configuration needs a good aeration to support the runner and spray water ventilation. The new housing is now a closed system; therefore, the required air is greatly reduced, the complete spray water outflow is now visibly reduced in foam. With this closed system, we can even create a suction effect towards the outlet of the housing.

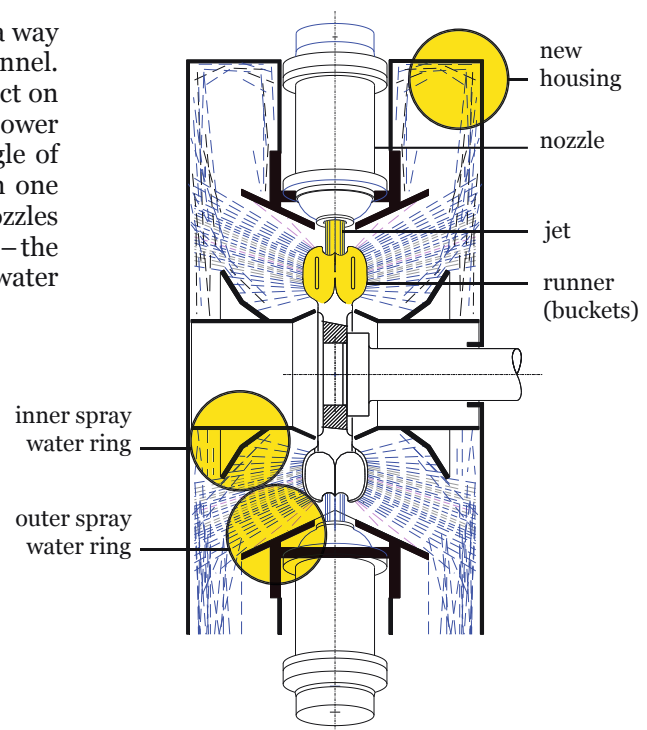


Fig. 2: Cross-section of the New Pelton Design

Taking horizontal a step further: Back to simplicity.

Subsequently to being able to handle the spray water, another idea presented itself: To build an axial and standardized distributor with hydraulic identical nozzle feeding pipes. So the basic concept can be used with the conventional distributor, see Fig. 1, as well as with an axial distributor, see Fig. 3.

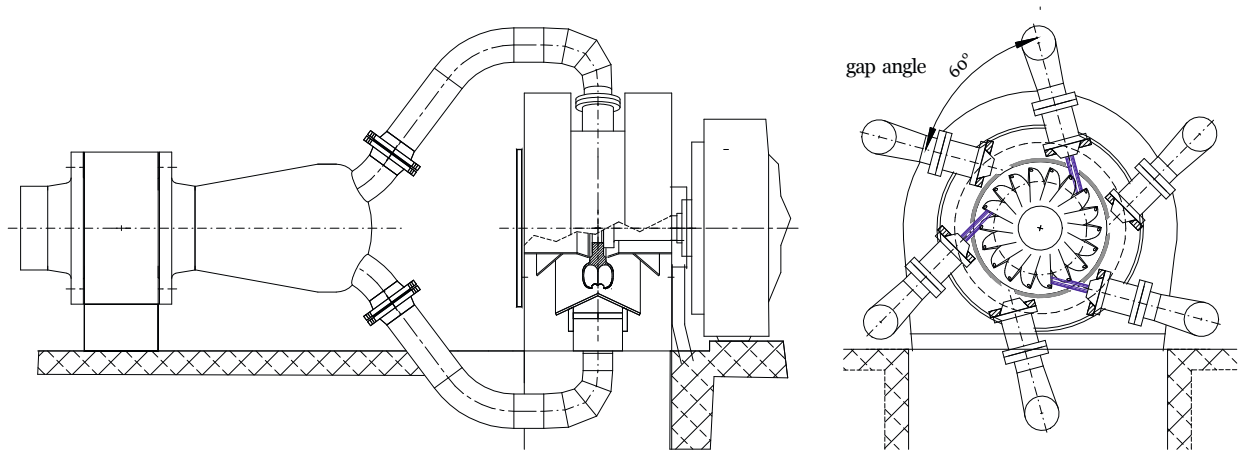


Fig. 3: Configuration with axial distributor with up to six nozzles

When using the option of an axial distributor, we have these additional benefits:

- Standard components can be used for the complete inflow arrangement – from the main closing device to the injectors
- Weight reduction of about 20 % and welding reduction up to 50 %, compared to a six jet conventional distributor
- Good for standardization and parametric design, easy to adapt to different runner diameters
- The housing concept is created in such a way, that for all nozzle combinations (2 to 6), the basic configuration is the same
- All nozzle inflow conditions are nearly equal; therefore, we have the same efficiency condition, independent of the active nozzle combination
- Easier extension of the gap angle between the nozzles

Now, who did all this?

Josef Martin Erlach is the inventor of the new Pelton Design. He simply set out to make things simpler. He also filed all four patents that now have been granted. The hard work of reaching market maturity was executed by him, our company, many senior experts and our research development partner Voith Hydro. Full homologue tests on a certified test rig were successfully performed at the University of Luzern under surveillance of Professor Staubli. Voith Hydro has been the first to acquire a licence for the spray water ring as well as for the axial distributor.

Many thanks go out to all of them for making this possible! *Dankeschön!*

*And yes, we're interested in finding new partners to take this project further. If you think about acquiring a patent license, give our Frankfurt office a call:
+49(0)69-25492454*

‘This is it!’

Professor Eberhard Göde

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