OSSBERGER

We make electricity flow…
…even at small streams!

Small Hydropower for own consumption in grid-parallel or off-grid operation

presented by

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Who is OSSBERGER?

OSSBERGER

- Since 1906 in Hydropower
- Family-owned
- Manufacturing in Germany

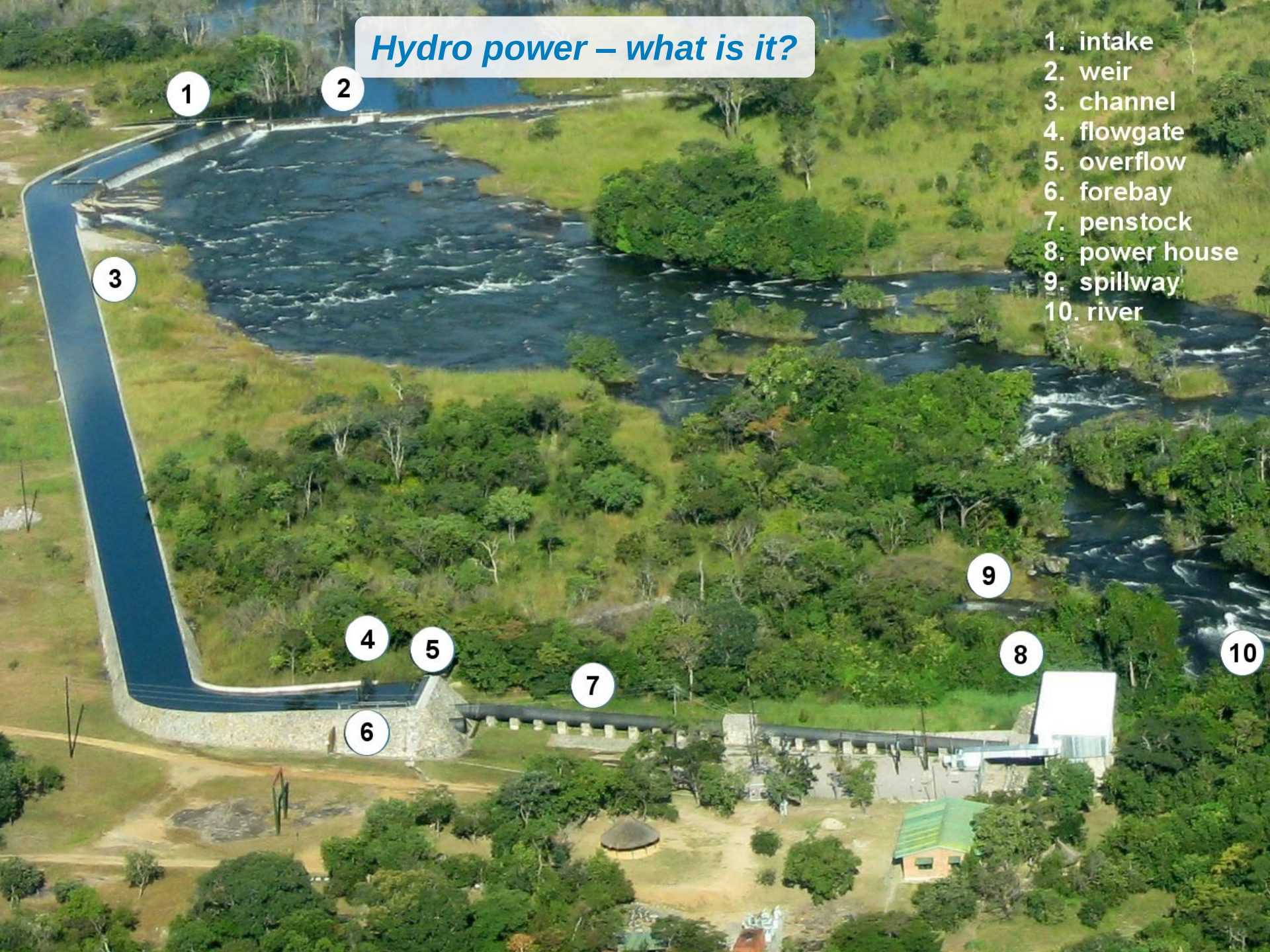
Hydropower Technology

- Turbines, e.g. Crossflow
- Turnkey
- Trash Rack Cleaners

Plastics Technology

Surface Technology

Other Business Units


Hydro power – what is it?
1. intake
2. weir
3. channel
4. flowgate
5. overflow
6. forebay
7. penstock
8. power house
9. spillway
10. river
1
2
3
4
5
6
7
8
9
10

Advantages of Small Hydropower

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- Less fluctuating as e.g., Photovoltaic or Wind Power
  => usually, no batteries required!
- Very sustainable source of power: Hydropower plants can usually be utilized for many decades, even for a century, without spoiling the environment.
- Low operation costs for Small Hydropower:
  - ✓ No consumables, only lubricants.
  - ✓ No fuel required.
  - ✓ Can be run automatically, without operator.
- Ability of island mode operation and “black start”
- Mature technology

Requirements for Small Hydropower

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- A stream of water (“flow”), flowing from a higher level to a lower level ⇨ height difference (“head”)
- A license for using the water flow
- Some piece of land, where you
  - ✓ capture the flow,
  - ✓ generate the (electrical) power and
  - ✓ return the flow to the stream
- Engineering know-how (mainly civil works)
- Capital for initial investment
- Optionally: a reservoir / dam
- Optionally: a feed-in permission / “Power Purchase Agreement” (PPA)

What should you consider?

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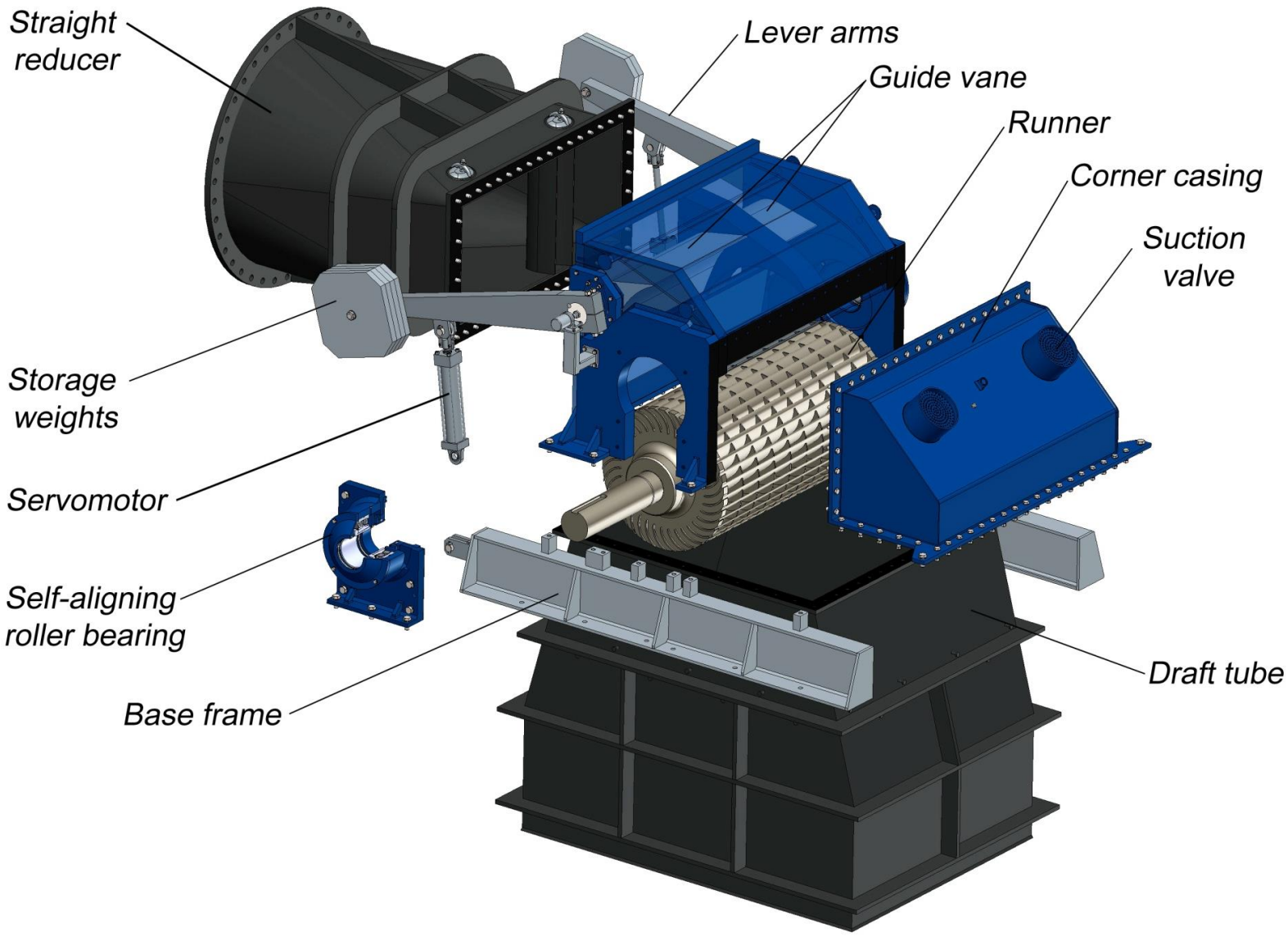
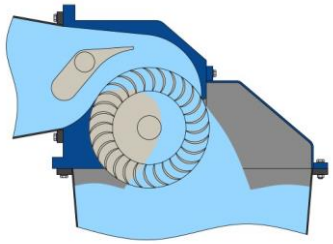
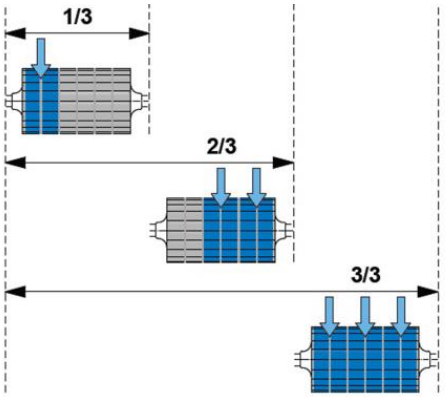
- Costs:
  - ✓ Requirements for installation: civil works and machine installation costly?
  - ✓ Maintenance: complicated and costly?
  - ✓ Reliable and durable quality?
- Operation:
  - ✓ automatic operation possible?
  - ✓ Operation at low flows (dry season) possible?
- Competence and reliability of the supplier:
  - Experience of the supplier?
  - Installation and commissioning service by the manufacturer available?
  - How long is the supplier already in the market?

The Original OSSBERGER® Crossflow Turbine



Advantages of the OSSBERGER Crossflow Turbine





- Very simple and robust design and technology
  - ⇨ Easy and less costly maintenance and operation!
- No tendency for clogging:
  - The runner is continuously flushed by the water flow crossing the runner.
  - The two wicket gates of the Crossflow Turbine are significantly bigger than those (many) of Francis and Kaplan turbines.
- Very good partial load operation behaviour: The OSSBERGER Crossflow Turbines come usually with two compartments, most of the time with a ratio of 1:2.
  - ⇨ Two turbines in one, a small one for low flows in the dry season, a bigger one for higher flows, and both combined for very high flows in the rainy season. Both cells can be regulated steplessly and independently of each other.

OSSBERGER Turbines for Own Consumption & Off-Grid

Cookhouse II in South Africa

H = 28 m
Q = 2000 l / s
N = 462 kW

Turbine in South Africa, supplying electricity to a farm in island mode.

Crossflow Projects – Punta del Cielo, Guatemala

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H = 117 m
Q = 1100 l / s
N = 1072 kW

Coffee producer in Guatemala.
Famous for his excellent coffee!

Crossflow Projects – Covadonga II, Guatemala

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H = 16 m
Q = 2000 l / s
N = 265 kW

Installed at the water supply for a fish farm in Guatemala

Crossflow Projects – Chania, Kenya

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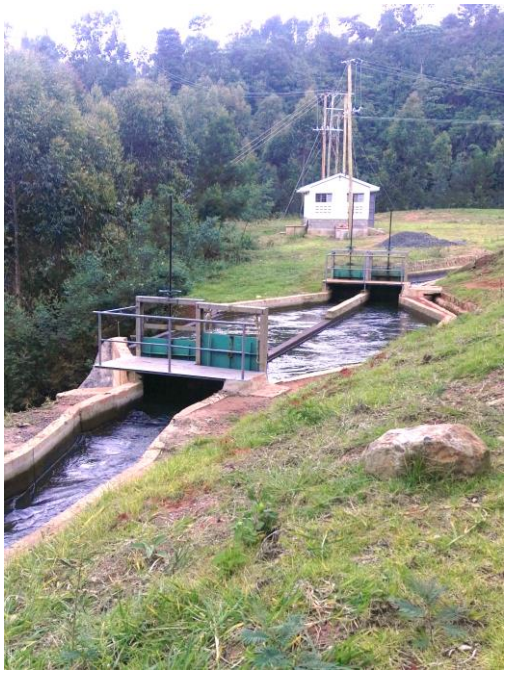
H = 44 m
Q = 2570 l / s
N = 978 kW



Project of a cooperation of tea farmers in Kenya. Replaces wood as fuel for the tea drying process.

Crossflow Projects – Terra Austral, Chile (Past)

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Past:

*Only Diesel generators suppling power to the isolated grid => **high costs for fuel, high CO2-discharge!***

Crossflow Projects – Terra Austral, Chile (Now)

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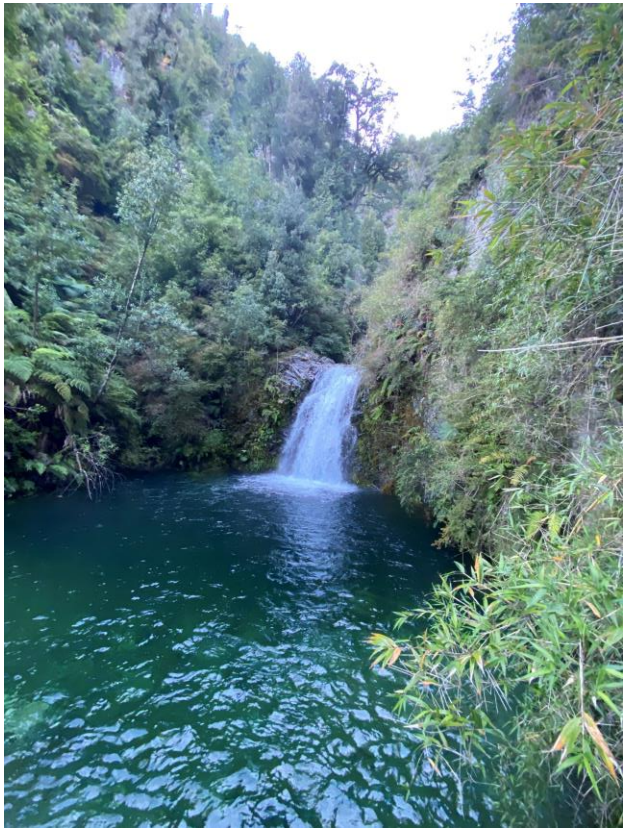
The solution:



Now: *One Ossberger crossflow turbine; Diesel generators only for back-up and dry season*
=> ***low costs for fuel, less CO2-discharge!***

H = 59,5 m
Q = 1525 l / s
N = 720 kW

Crossflow Projects – Turbina PFA, Chile

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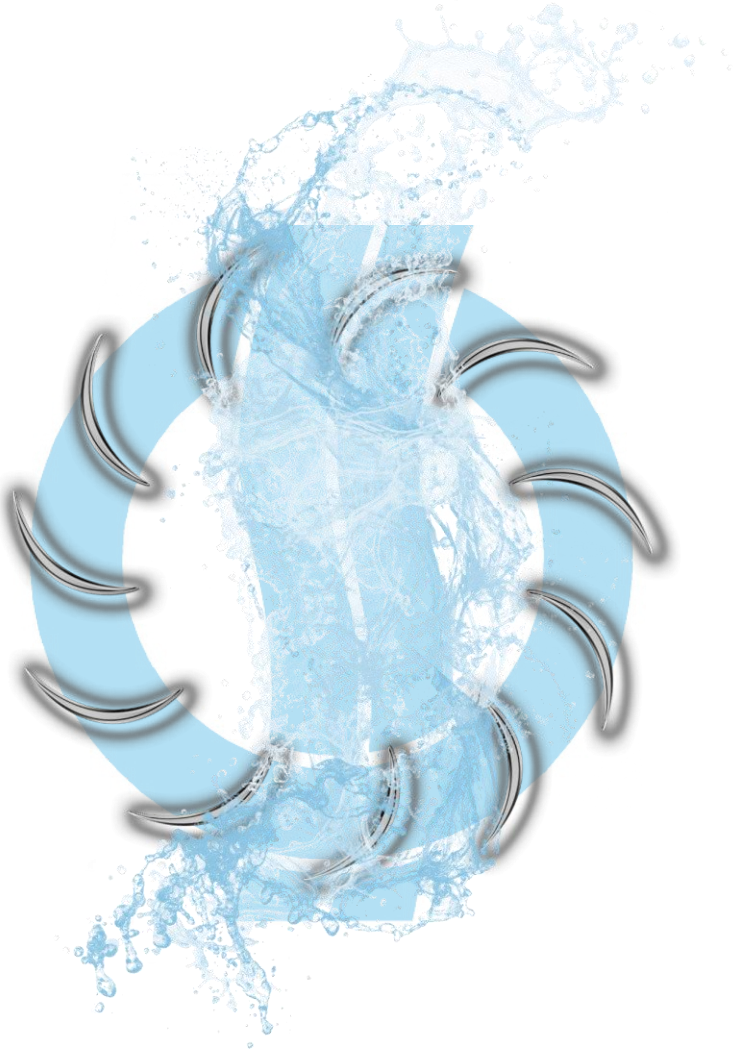
H = 44 m
Q = 2900 l / s
N = 1096 kW

Second project for a fish farm in South Chile:
Now there are two OSSBERGER Crossflow Turbines installed in the farm's water supply.

Why OSSBERGER?

- Competence in Small Hydropower: more than 10.000 *OSSBERGER* Crossflow Turbines installed!
- Reliable family business with an experience of more than 100 years!
- Mature technology “Made in Germany”!
- Each *OSSBERGER* Crossflow Turbine is tailor-made to the project, between approx. 15 – 6.000 kW!
- *OSSBERGER* has supplied hundreds of turbines for island mode operation and for own consumption!

Thank you for your attention!



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