Siphon turbine
for <u>ultra-low</u> head sites
(1.5 – 3.5 m)

Mhylab
Vincent Denis, Bruno Reul, Aline Choulot
Hidroenergia 2010, Lausanne

Ultra-low head potentials

➢ **Rehabilitations**

➢Adapted techniques: just recently

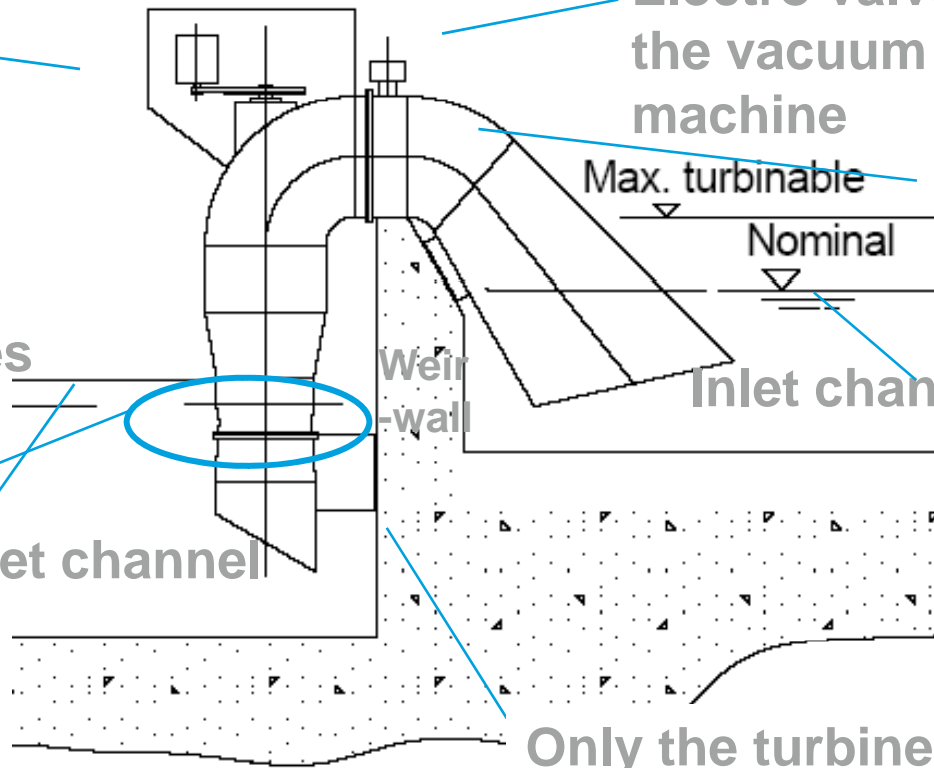➢Heritage maintenance

➢Financing help for fish migration device

Siphon turbine®

Generator, frequency converter, speed increaser, Vacuum pump

Electro valve to break down the vacuum and stop the machine

Max. turbinable

Nominal

Square-inlet section

Fixed guide vanes

4 fixed or adjustable blades

Weir -wall
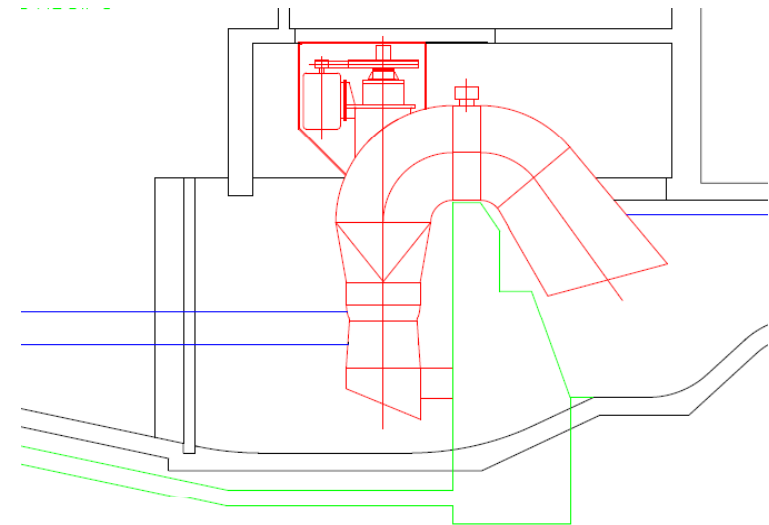
Upstream level

Inlet channel

Outlet channel

Downstream level

Only the turbine inlet and the draft tube are set in the weir wall

Siphon turbine®: advantages

➢**Affordable technique, less expensive than bulb turbines**

➢**Simple design**

➢**Civil engineering = reduced to a simple weir-wall**

➢**Mass-produced blades and runners**
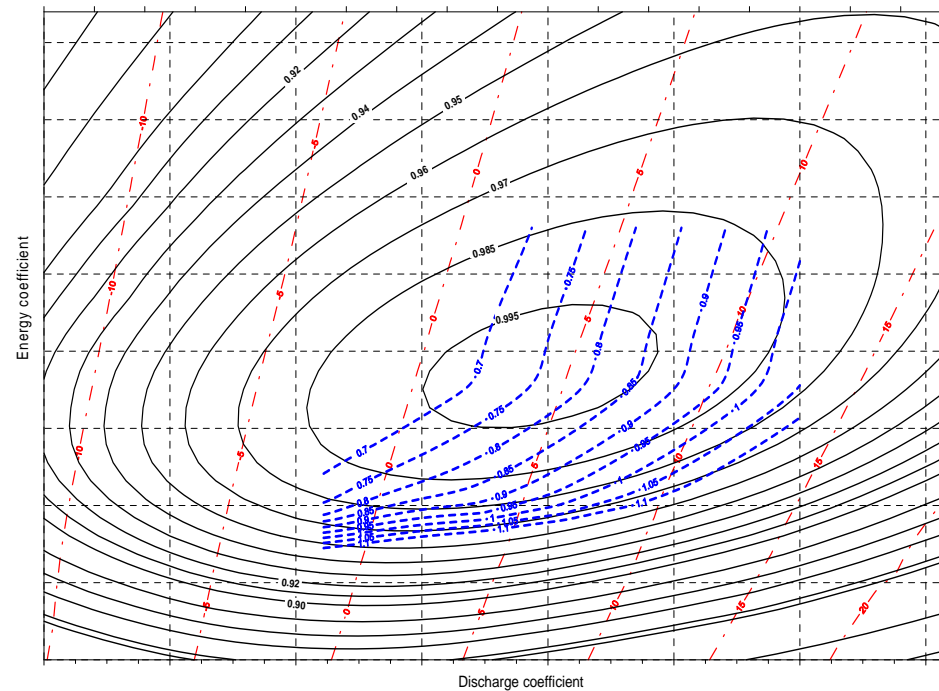
➢**High performances**

➢**Low operation costs**

Base for standardisation

Mhylab's laboratory

Hill chart for dimensioning and efficiency guarantees

6 runner diameters (De)
From 10 to 400 kW

De = 2.00 m

De = 1.65 m

De = 1.40 m

De = 1.20 m

De = 1.00 m

De = 0.80 m

Nominal discharge (m³/s)

Head (meters)
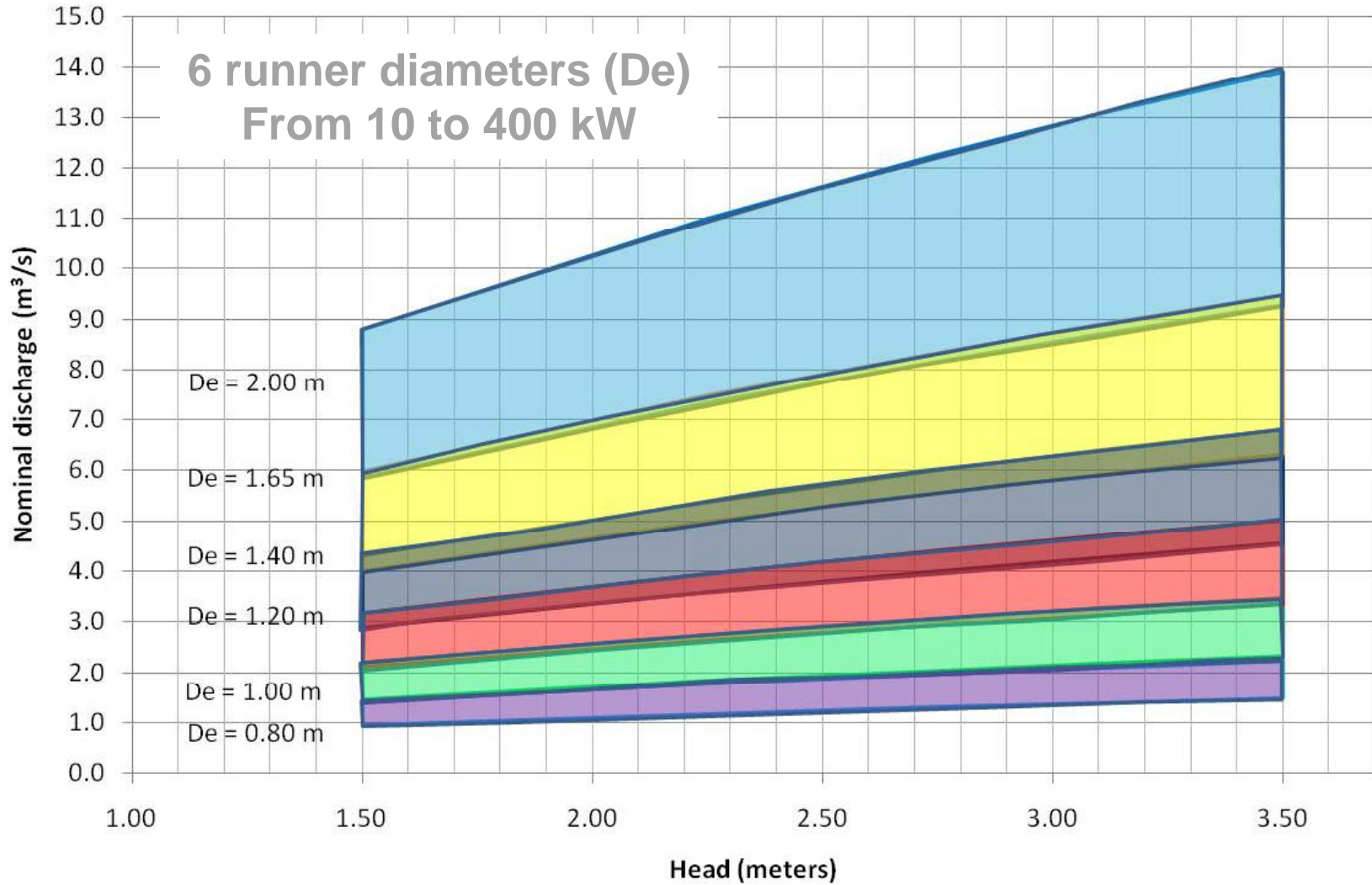
Siphon turbine®: Flexibility

For the same runner diameter, adaptation to the site characteristics of :

➤ The rotation speed

➤ The guide vane opening

➤ The runner blade opening and its evolution

➤ the number of turbines

→ To optimise the production
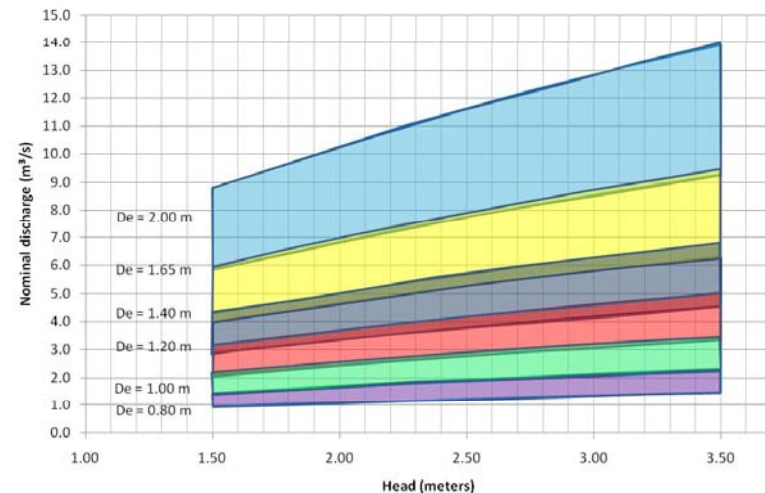
Standardization and mass production from the inlet elbow to the first draft tube cone:
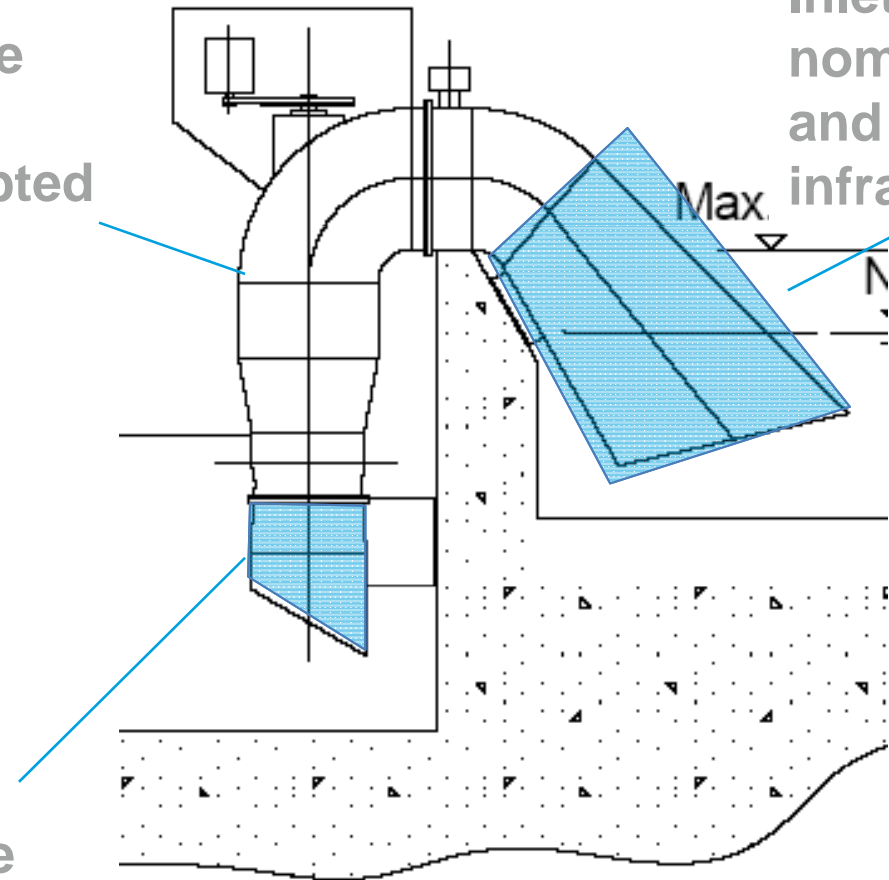
-Guide vanes

-Runner

-blades

Max. turbi
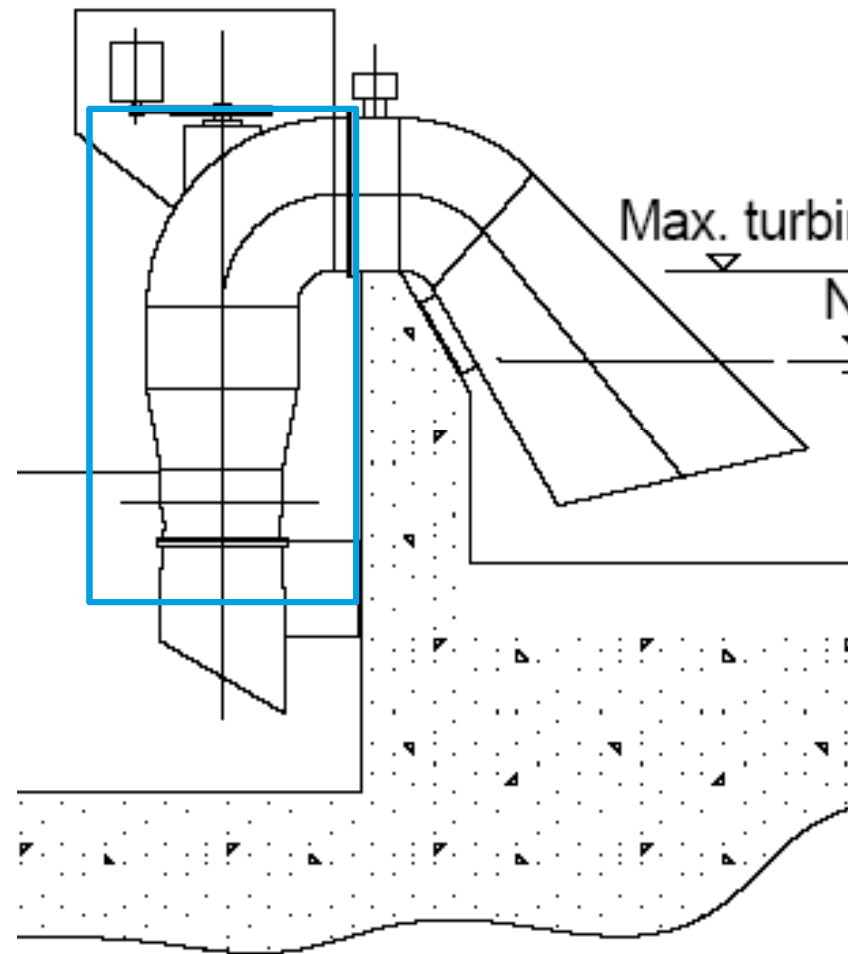
N

Angle between the inlet axis and the turbine shaft adapted to the site

Inlet adapted to the nominal discharge and the existing infrastructure

Draft tube outlet adapted to the nominal discharge

Max.

Other setting: with an inclined axis
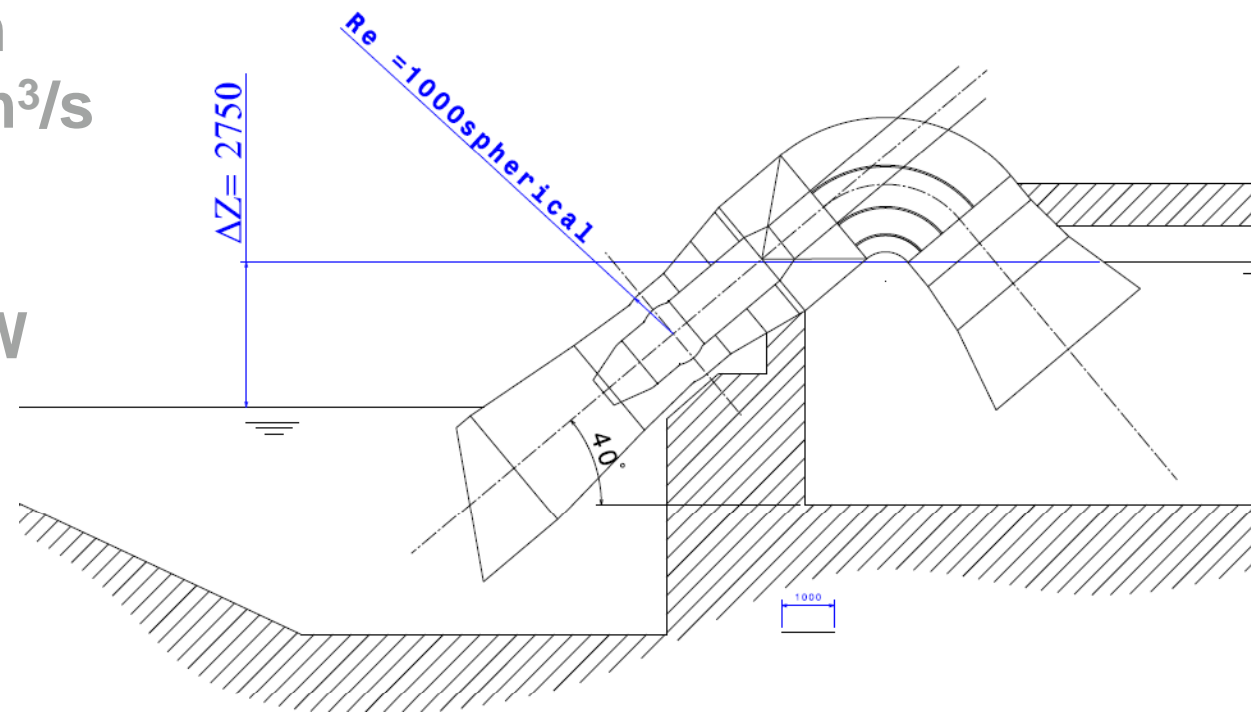
Site in the North East of France
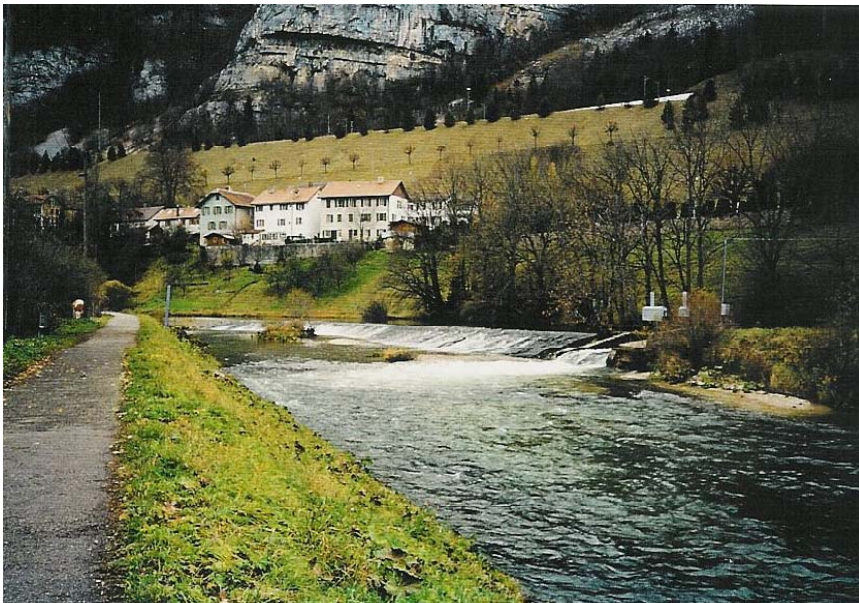
ΔZ = 2.75 m

Qn = 10.6 m³/s

De = 2.0 m

113 rpm

Pe = 200 kW

Rehabilitation of the Moutiers site (CH)

First water right: 1893

2 siphon turbines on the Orbe river in Vallorbe

- Runner with 4 adjustable blade
- Commissioning year: 2009
- Gross head: 2.1 m
- Max. discharge per group: 2.5 m³/s
- Max. electrical output per group: 40kW
- Hydraulic design: Mhylab (CH)

Feedback:
1. Foreseen performances: reached
2. Smooth start up and shut down
3. Good integration to the infrastructure

Example of setting zoom on the generator

The project marketing

Mhylab : non profit-making foundation,

Independent of any manufacturers

→Supplies the hydraulic profile and performances available for any manufacturers

The manufacturer: in charge of the mechanical design, manufacturing and marketing

To know more

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