



GRAVEL EXCLUDER –  
A NEW METHOD FOR PASSING SUBSTRATE OVER WEIRS  
SUSHP, TRONDHEIM – 14<sup>TH</sup> JUNE 2023

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GRAVEL EXCLUDER –

A NEW METHOD FOR PASSING CLEAN WATER INTO INTAKES

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# Gravel excluder has been tested thanks to:

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HydroCen is a research center for environmental energy based in Trondheim to enable the hydropower sector to exploit innovative technological solutions.



Eviny is a Norwegian power company based in Bergen, with annual production of 7 TWh produced from 29 hydroelectric power plants

# SediCon:



Supplier providing in-house developed sediment handling equipment to the hydropower industry.

- Hydrosuction dredgers for reservoirs
- Gravity powered Sluicer Systems for desanders
- Recovery / re-opening of bottom gates and intakes
- Boulder / gravel excluders for brook intakes

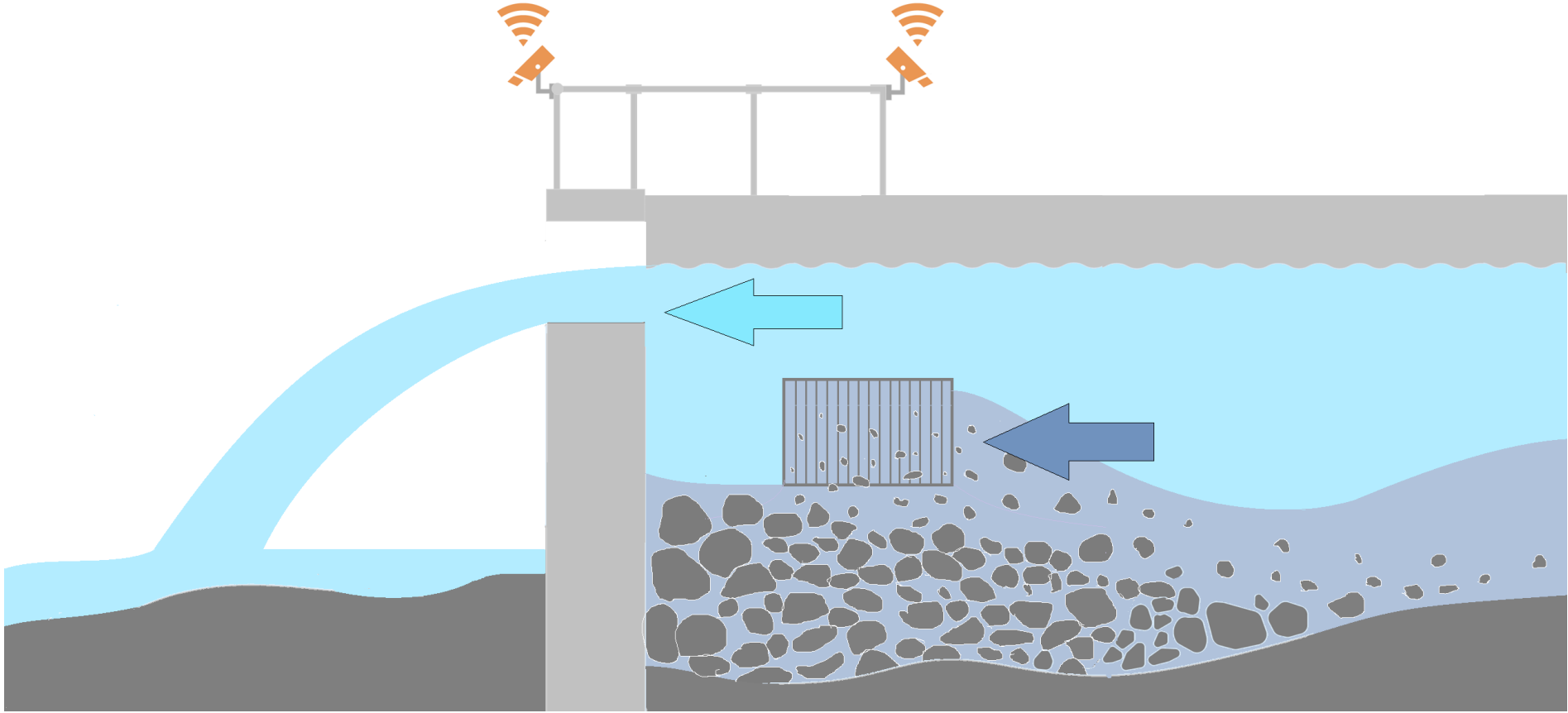
Technologies are based on PhD at NTNU 1993-1997.

Export to 23 countries, mainly outside Europe

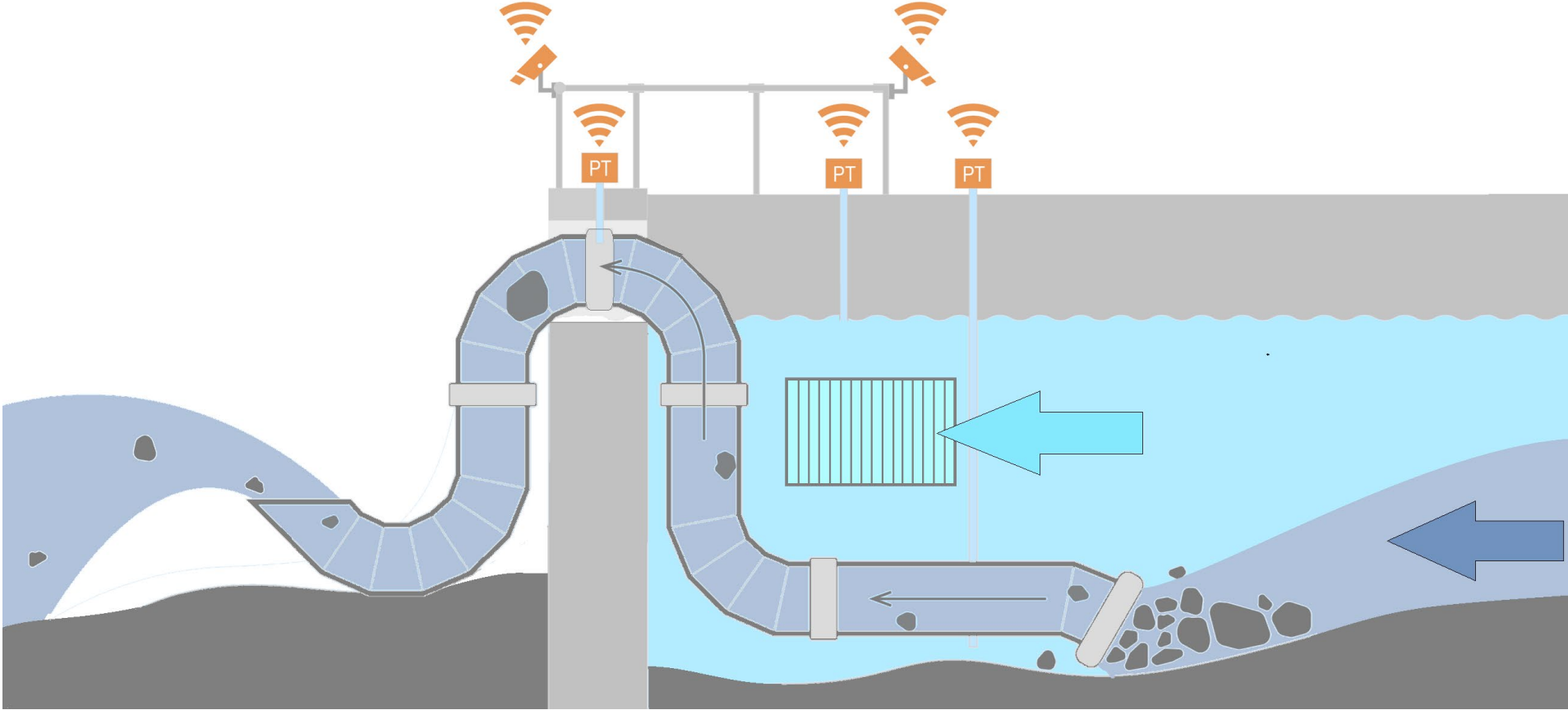


# Intake (or pond) without boulder excluder

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# Principle of the boulder excluder



# Model test scale 1:16

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## MODEL:

Outer diameter 75 mm

Weight of the stone was 170 g

Size stone: 40 x 60 x 70 mm

Height weir approx. 160 mm

## CORRESPONDS IN PROTOTYPE:

Outer diameter 1200 mm

Weight of the stone was 698 kg

Size stone: 640 x 960 x 1120 mm

Height weir approx. 2.5 M



# Suction of rock:

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Filmed at offshore project  
- Technology developed by SediCon



# Pilot test-scale test in Tysso intake Ulvik in power plant

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Outer diameter 1200 mm

5 m<sup>3</sup> /s discharge

1.0 meters rock size

*Conceptual sketch in 2019, prior to final design and installation*

# Installation:

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Transport of large components was a challenge but we managed

Helicopter transport 3 km from road, max 1100 kg to use normal helicopter

Slings and jacks used to pull the two parts together

Welding with electrofusion



# Installed and ready for operation

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# Normal flood in October 2021

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First confirmation ever that technology works - the boulder excluder started and stopped completely autonomously



# 100-year flood 11 November 2022:

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Photos were taken early December, after the flood:



- 25% above 50-year flood
- Boulder excluder 100% intakt
- The intake is 100% open
- Wide area of influence
- Autonomous operation verified
- Client: “very impressed”

# New projects

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Pictures from Nystølbekken, Ulla-Førre (last week) 710 mm excluder.

Aneo / TrønderEnergi and Småkraft has also ordered, several others are considering offers, including international small to medium run-of-river

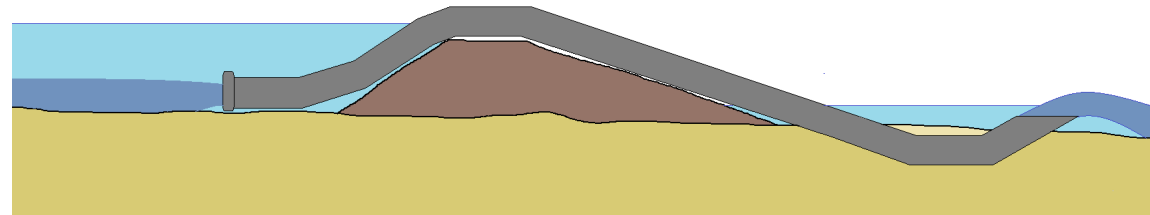


# Bypassing substrate in rivers:

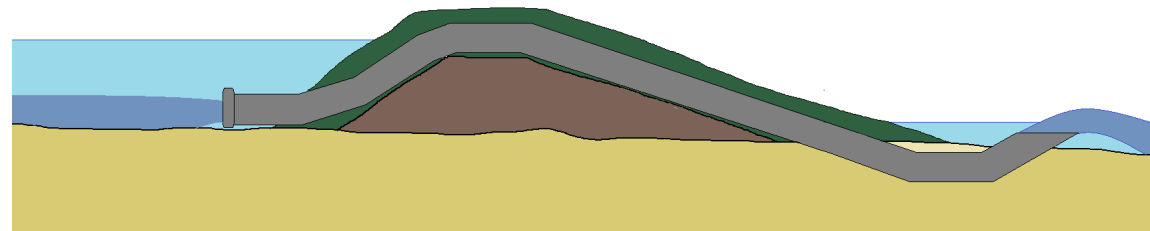
Past fish barriers

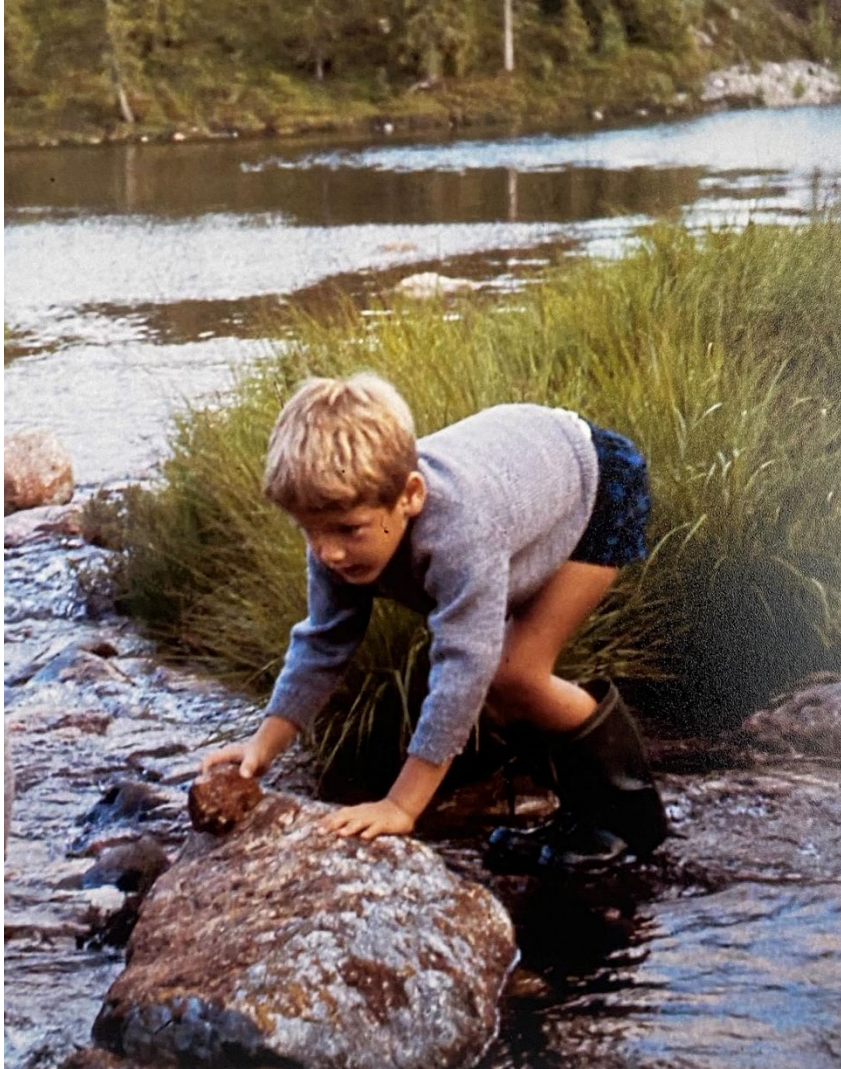


- Even less than 1,0-meter head can move boulders
- The gravel excluder can be covered
- Up to 1,4 m size is possible



Past weirs





Thank you!

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