HydroCen – Content and status of WP1 Hydropower structures

Hydropower Summit 2020

NTNU

by WP1-leader Prof. Leif Lia

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NORWEGIAN RESEARCH CENTRE FOR HYDRO POWER TECHNOLOGY

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CENTRE FOR ENVIRONMENT-FRIENDLY ENERGY RESEARCH
The Research Council of Norway

WP1 Introduction

Hydropower structures

WP1.1 Tunnel systems

WP1.2 Dams and dam safety

WP1.3 Sediment handling

WP1.4 Fish friendly intakes

Several associate projects

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WP1 Key personel

Hydropower structures

WP1.1 Tunnel systems

WP1.2 Dams and dam safety

WP1.3 Sediment handling

WP1.4 Fish friendly intakes

Several associate projects

1.1 Bjørn Nilsen

1.2 Fjola G. Sigtryggsdottir

1.3 Nils Rüther

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The PhD-students

Bibek Neupane

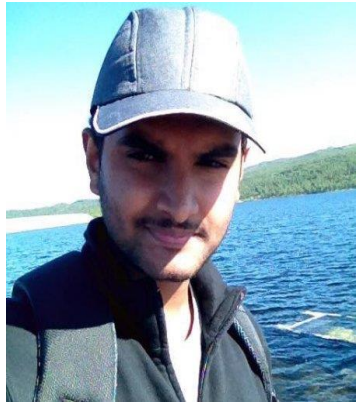
Ola Haugen Havrevoll

Lena Selen

Livia Pitorac

Henki Ødegaard

Geir Helge Kiplesund



Ganesh Ravindra

Halvor Kjærås

Diwash Lal Maskey

Einar Rødtang

Nirmal Acharya

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WP1.1 –Tunnel systems

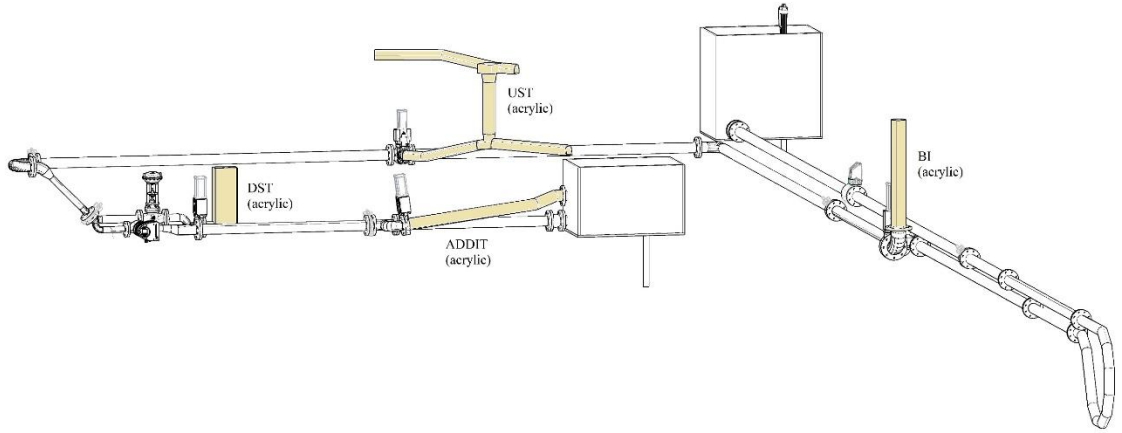
Five PhD-projects started in 2017

1. *Influence on stability and rock support from swelling rock mass*
2. *Consequences for rock mass from rapid changes in water velocity and pressure*
3. *Development of test procedures for design of transition from unlined tunnel to penstock*
4. *Design of tunnel systems in redesign from HPP to PSP*
5. *New concepts for pressurized rocktraps in hydropower tunnels*

WP 1.1 Tunnel systems

Hydraulic laboratory work since 2018

- Sand trap model for Tonstad HPP 320 MW unit completed (1:20)
- Tunnel system model of Roskrepp HPP nearly finished (1:67)
- Laboratory test rig for rock stress measurements under construction



WP 1.2 Dams and dam safety

Development of innovative and safe solutions for dams!

Only focus on rockfill dams

WP 1.3 SEDIMENT HANDLING

A1.3.1: Toolbox for sustainable, resilient and cost-effective sediment handling

Binga Reservoir

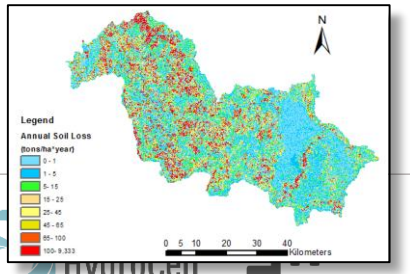
A1.3.2: Sediment handling in Francis turbines

Francis Turbine Runner at KTU

A1.3.3: Combined sediment and fish bypass solutions, win-win?

Asahi Dam Reservoir at the Outlet of Bypass Tunn

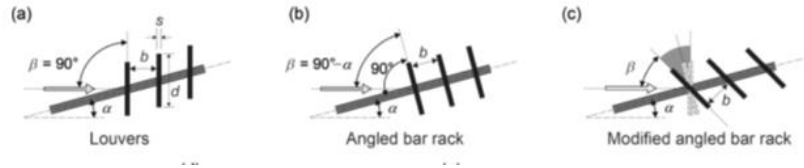
A1.3.4: Tool for the assessment of sediment loads and measures from river basins to reservoirs



Devoll catchment

WP1.4 Fish friendly intakes

- Sub-project from WP4.2 Floating fences
- One PhD-student is working with the CFD part
- Manufacturing of the prototype during the winter 2020 (???)
- Installed and tested spring/summer 2020



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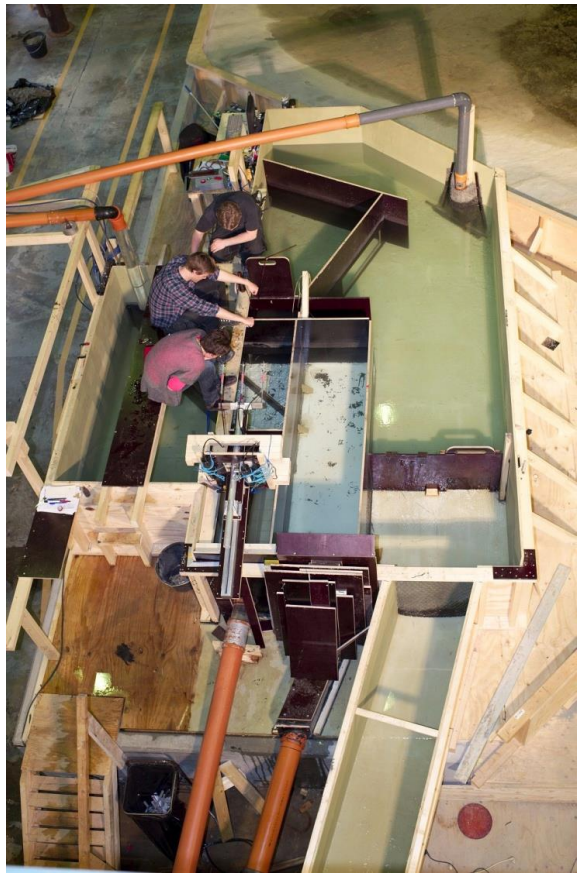
WP 1.1 Fish friendly intakes

Other initiatives

Further development of the Coanda intake

- Snorkel device
- Environmental flow device
- Protection racks
- Pre-fab solutions



Open Calls – Internal projects i HydroCen

- New initiatives in 2020
  - Real-time monitoring of dams and rock mass (for real-time evaluation of dam safety)
  - Automatic sediment flushing from brook intakes
  - Blocking of tunnels with air inflated plugs

Summary status WP1

- Project WP1.1, WP1.2, WP1.3 and WP1.4 is ongoing without unexpected delays
- More involvement from Sintef and NINA
  - Mainly in WP1.3
- Several PhD-students will finish in 2020
- More projects have to be initiated and started in 2020