

Hydro Design Management Co. Pvt Ltd, Delhi - India

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Sustainable Innovation

- **Sediment Management**
 - Inflatable Rubber Weir
 - Silt Flushing System for Desander
 - Gravel Flushing System for Gravel Trap
 - Trash Rack Cleaning System



Hydro Design Management Co. Pvt Ltd

Established - 2002

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Sustainable Innovation

- Design optimization, Detailed design and Engineering – Hydro Projects
- Cost economical – Inflatable Rubber Weir
- Sediment flushing systems for desanders
- Gravel Flushing System for Gravel Trap
- Dredging systems for reservoirs, dams and canals etc
- Basalt fiber and Micro Silica for Concrete
- Private equity investments and M&A

Inflatable Rubber Weir



- Hydro Design together with its European partner Hydro-Construct, design and supplies inflatable rubber weir for hydro power projects, irrigation projects, water shed management etc.
- The European partner has more than 40 years of experience in various countries such as India, Austria, Switzerland, Germany, Italy etc in design and supply of inflatable rubber dams and pneumatically-operated spillway gates.
- Hydro-Construct is currently supplying rubber dam of 256 m length and 3 meter height in 4 spans. Gomti river is a perennial river and a tributary of River Ganges. The average discharge in the Gomti river is 250 Cumecs

Introduction - Inflatable Rubber Weir



- Rubber dams- long tubular shaped fabrics placed across channels, streams & weir crest to raise u/s water level when inflated.
- It is similar to sausage-shaped balloon anchored to stream bed.
- When filled with water/ air, it rises to block water.
- When water or air released, dam body flattens on its foundation to permit free flow of water.

History - Inflatable Rubber Weir

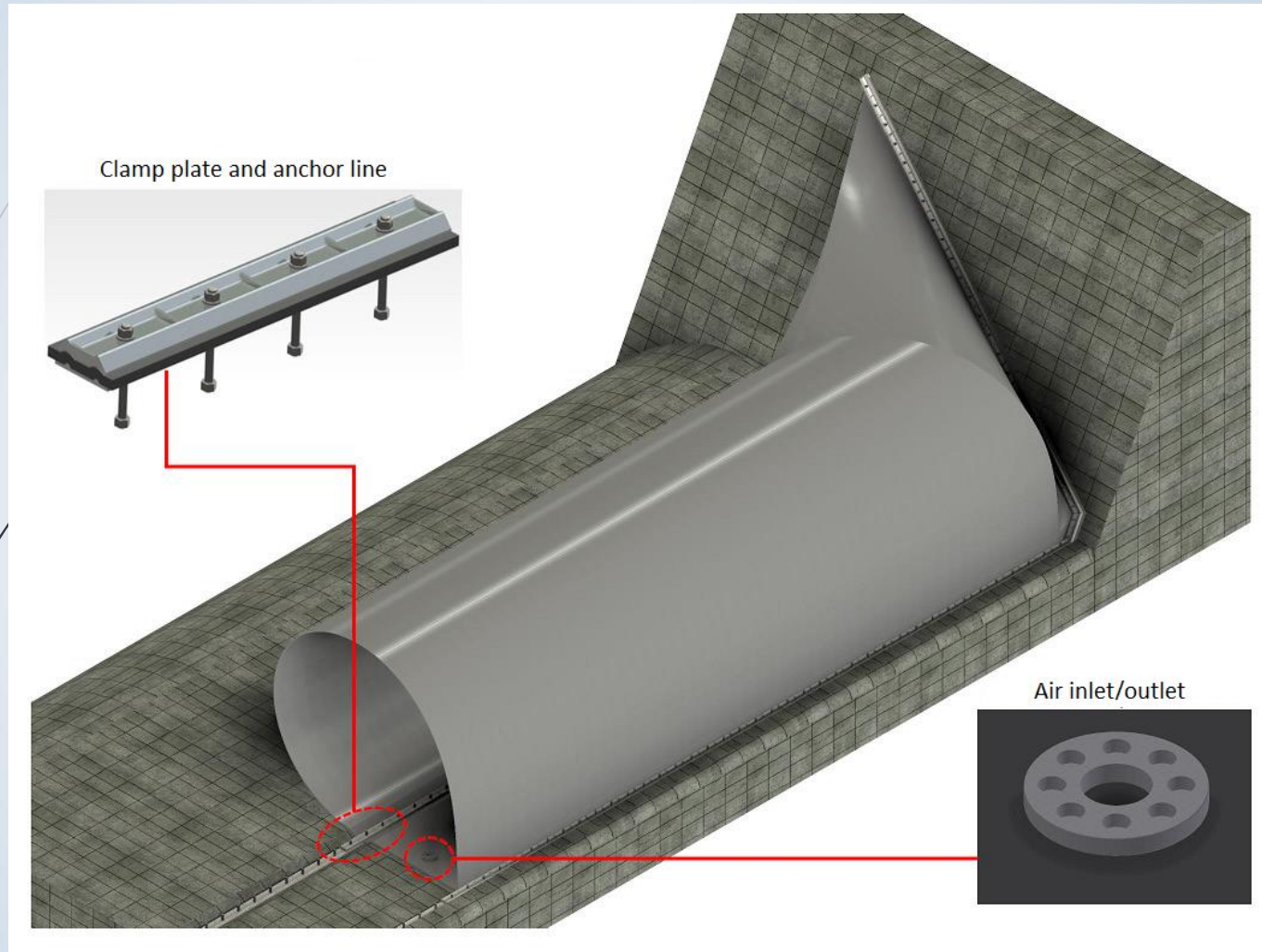


- Rubber dams- were developed in 1950s
- World's first inflatable rubber dam was installed in Los Angeles in USA
- There are more than 2000 inflatable rubber dam around the world.
- Durability can be excellent: A 35-year-old dam in eastern Ontario, Canada was replaced, and while still functional in both freezing winter conditions when it was air filled, and water filled in summer, it was deemed to have served its useful life, and was replaced.

Construction of Inflatable Rubber Weir



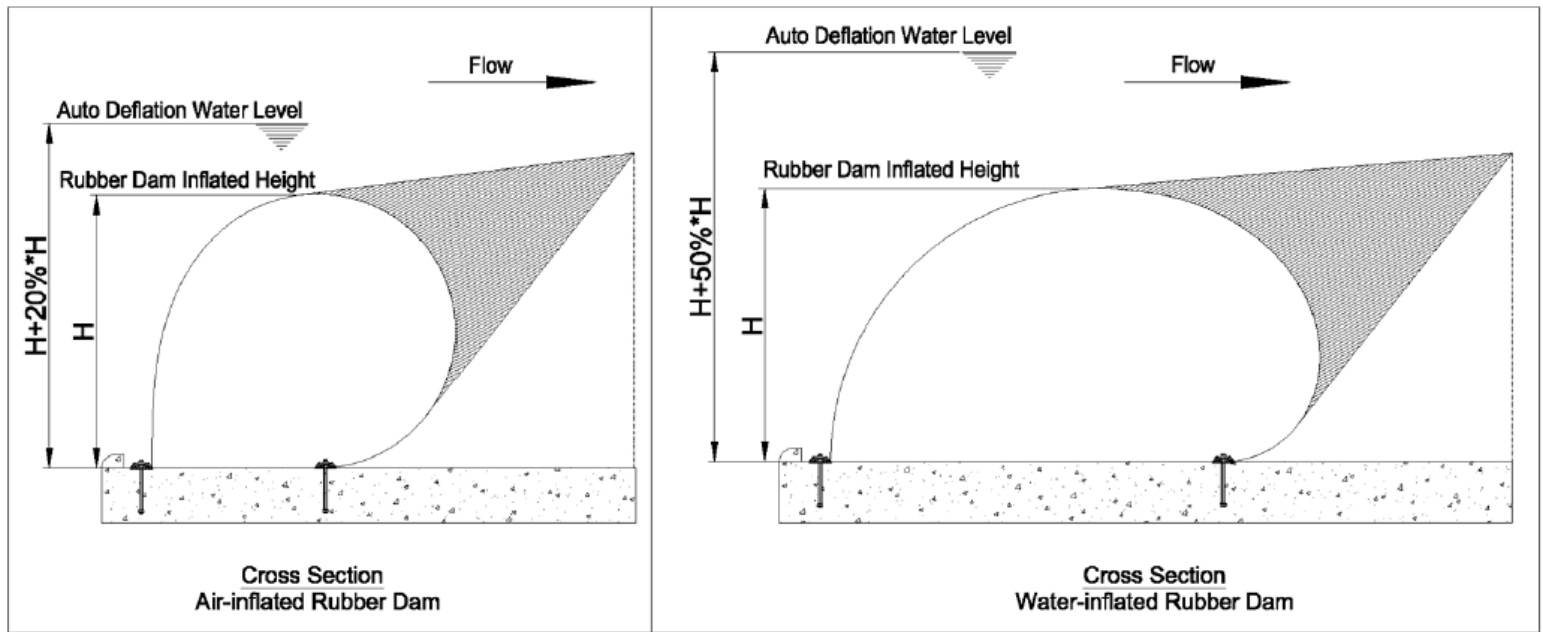
Inflatable Rubber Weir - Technology



Types of Inflatable Rubber Weir

There are two types of inflatable rubber Weir; air inflated and water filled. The inflatable rubber weir is designed and manufactured according to the 2000 version of the Japanese technical standards for inflatable rubber weir.

Drawing 1: Cross Section - Typical Air and Water Inflated Rubber Dam



Features of Air Inflated Rubber Weir

- Maximum overtopping: 20% of dam height.
- Smaller cross-section profile.
- Faster inflation/deflation time.
- Lower cost.
- Difficult to control upstream water level
- V-notch condition occurs during deflation or when pressure is low.



Features of Water Inflated Rubber Weir

- ▶ Maximum overtopping: 50% of dam height.
- ▶ More stable due to weight of water inside dam.
- ▶ No “V-notch” condition during deflation.
- ▶ A degree of upstream water regulation is possible.
- ▶ Larger pipe sizes required.
- ▶ Slower inflate/deflate time.
- ▶ Larger cross-section profile.



Advantages of Inflatable Rubber Weir

In comparison with conventional weir systems main advantages are:

- Flexible weir structure, allowing discharge of sediments, debris and ice
- Fully automatic reservoir level control
- Self acting flood release; 3-fold safety system is acting even case of failure of power supply
- Renovation and reconstruction of existing weir structures
- Absence of mechanical components eliminates corrosion risk
- Low maintenance and operation costs due to minimal energy requirements
- More than 100 examples built since 1977

Essential Components of Inflatable Rubber Weir

- Base weir plate and side walls of reinforced concrete
- Clamping profiles for fastening the membrane, galvanized or high-grade stainless steel
- Pipe system for filling and emptying the Rubber dam
- Rubber membrane with fabric lining from 10 to 20 mm thickness
- Shaft system for regulation and control
- 3-fold safety system enabling deflation even without power supply
- Switch panel with electric and electronic equipment.

Control Room of Inflatable Rubber Weir



Service life of Inflatable Rubber Weir

The service life of a rubber dam is between 30 and 35 years depending on several factors:

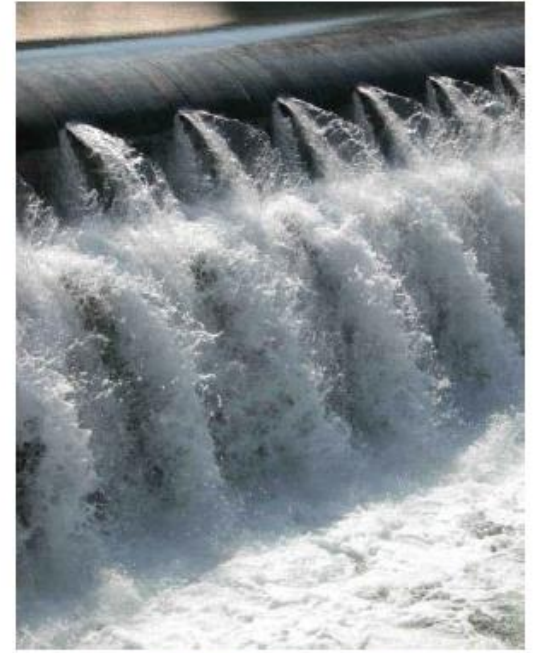
- ▶ Weather conditions: UV and ozone have a harmful effect on rubber material; cool temperate climates are most suitable for rubber dams, dry, arid areas are the most challenging.
- ▶ Extremes in temperature can affect the service life of the rubber dam. The rubber loses some elasticity at temperatures below -25 deg C (-13 deg F).
- ▶ The rubber sheet used in the rubber dam uses four layers of nylon fabric properly vulcanized with warp and weft more than 1200 KN/M. Any sharp moving objects like broken glass bottles, sharp tree branches, steel parts, boulders and stones etc with moving velocity of more than 5 m/s have been tested and no damages are reported.
- ▶ However any potentially damage due to moving debris/boulders on the rubber surface can be patched as per the needs using locally available tyre puncture material.

Maintenance of Inflatable Rubber Weir

- ▶ The rubber body of the rubber dam is virtually maintenance free. It has no mechanical parts and it requires no painting or other corrosion protection.
- ▶ If the rubber body is damaged for whatever reason, it can be repaired quickly and easily using standard, off-the-shelf car and truck tyre repair products.
- ▶ The function of the rubber dam will not be affected by any repair provided the repair is carried out using approved materials and procedures.
- ▶ The control equipment should be maintained in accordance with the manufacturer's recommendations.

Inflatable Rubber Weir in Hydro Projects

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Inflatable Rubber Weir in Hydro Projects

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4m high x 33m wide x 2 spans

Azmaç II, Turkey, Hydropower

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5m high x 48m wide x 1 span (water-filled)

River N'Zi, Ivory Coast, Irrigation



3.1m high x 30.25m wide x 2 spans

Jura, Scotland, Hydropower (storage scheme)

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1.35m high x 15m wide

Camporgiano, Italy, Hydropower

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2.58 m high x 24m wide

Donnacona, Canada, Hydropower

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1.95m high x 23m wide x 4 spans

Rubber Dam in Hydro power project

Reinischwehr, Sill / Tirol Austria



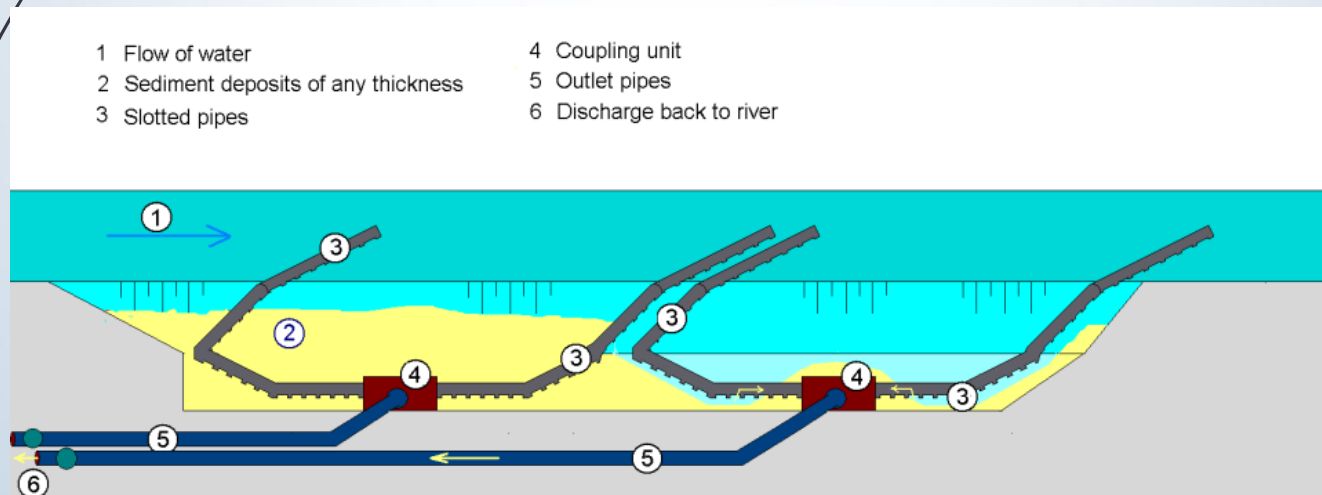
- Sill river is a steep river
- River carries lots of boulders and stones during flood
- Three hydropower projects in the same river
- All the three projects are equipped with Inflatable rubber weir
- 20 years old project

Cost Benefits – Inflatable Rubber Weir

- For air filled rubber dam, the cost is INR 3.58 Lacs per meter of length per meter of height eg. 50 m length 1.5 m high rubber dam cost will be INR $3.58 \times 50 \times 1.5 = 268.5$ Lacs
- For water filled rubber dam, the cost is about 30% higher compared with air filled.
- Under sluice requirement may be replaced with a smaller span of rubber dam.
- It may also be possible to eliminate undersluice bay structure and thus cost is reduced.
- The over all cost of rubber dam structure is typically 10 – 15% less compared with conventional design.

Silt Flushing System: Desanders & Rocktraps

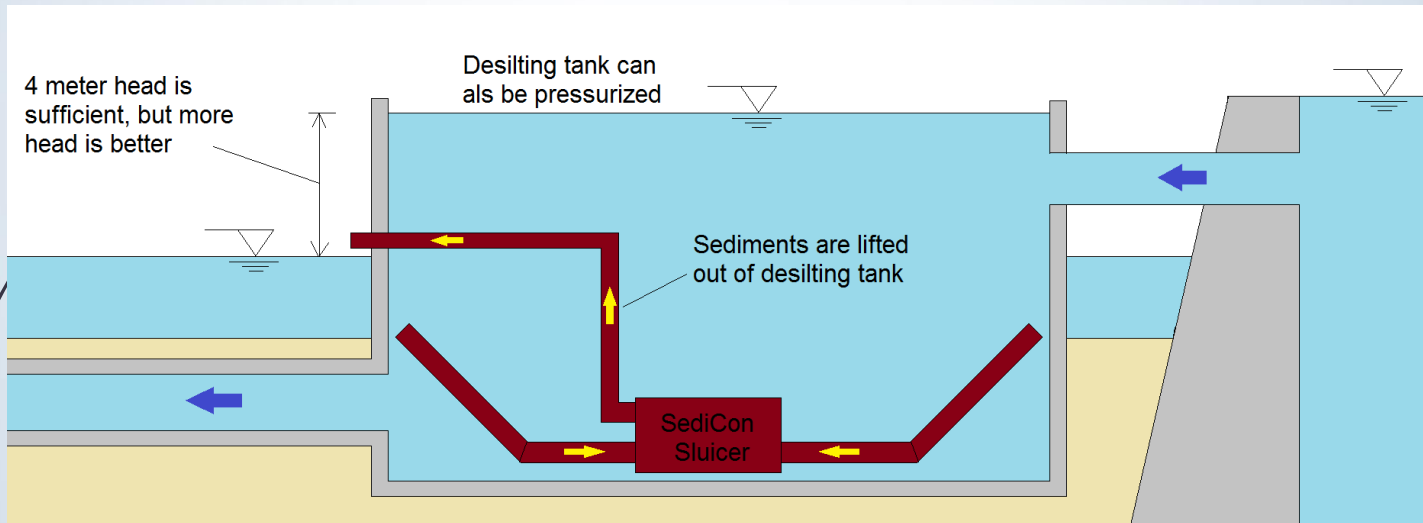
- The available head between the sand trap and the outlet is the driving force.
- Very low water consumption
- No movable parts and extreme reliability
- Can be designed for any capacity.
- Stones and gravels will be removed
- Tranquilizers/fine trash rack is recommended to avoid large debris entering into the desander
- Intermittent operation



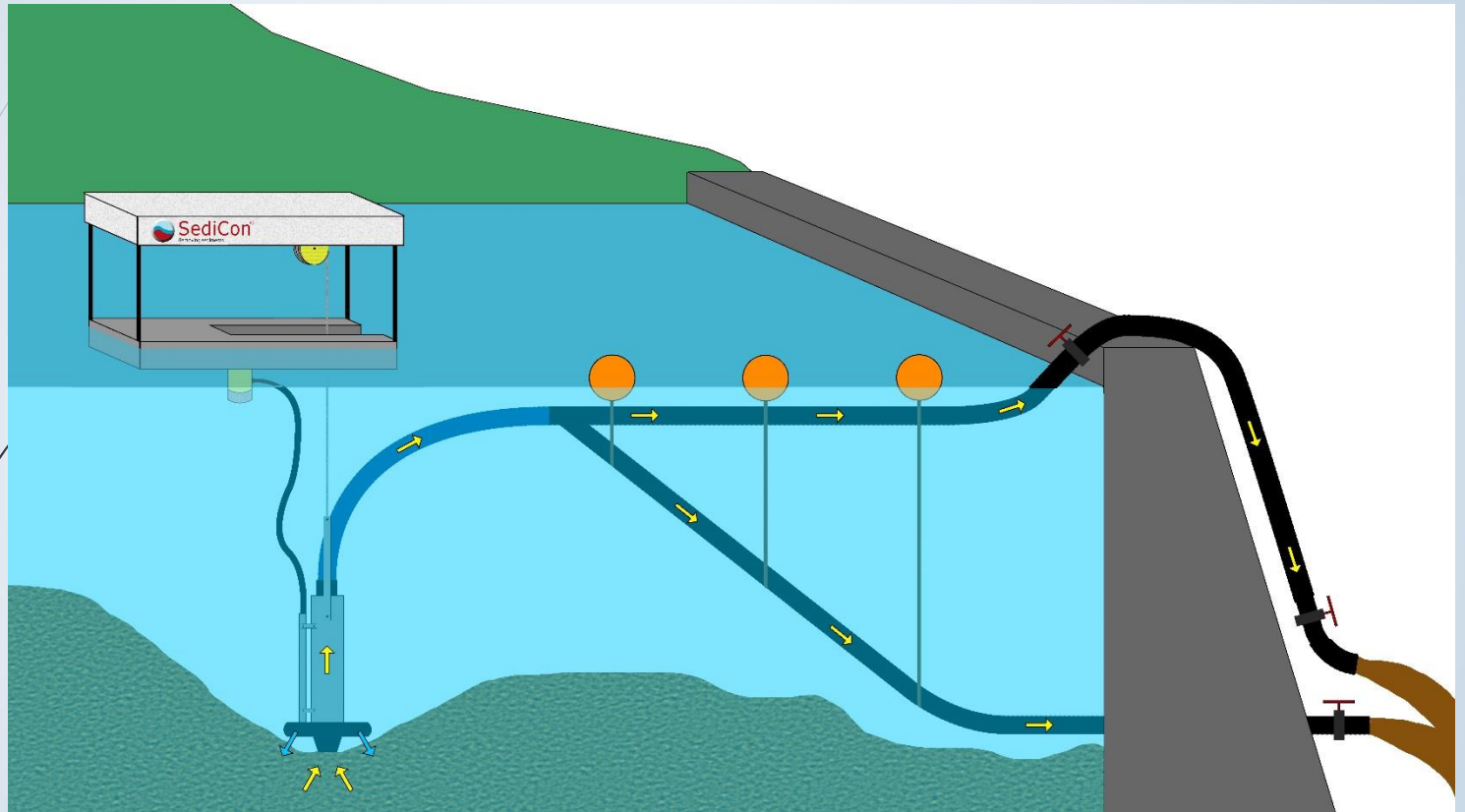
Principle: Pressurized outlet

Pressurized outlet - low head required

Low water consumption and high capacity



Dredge for Reservoir



Sediment Removal Management

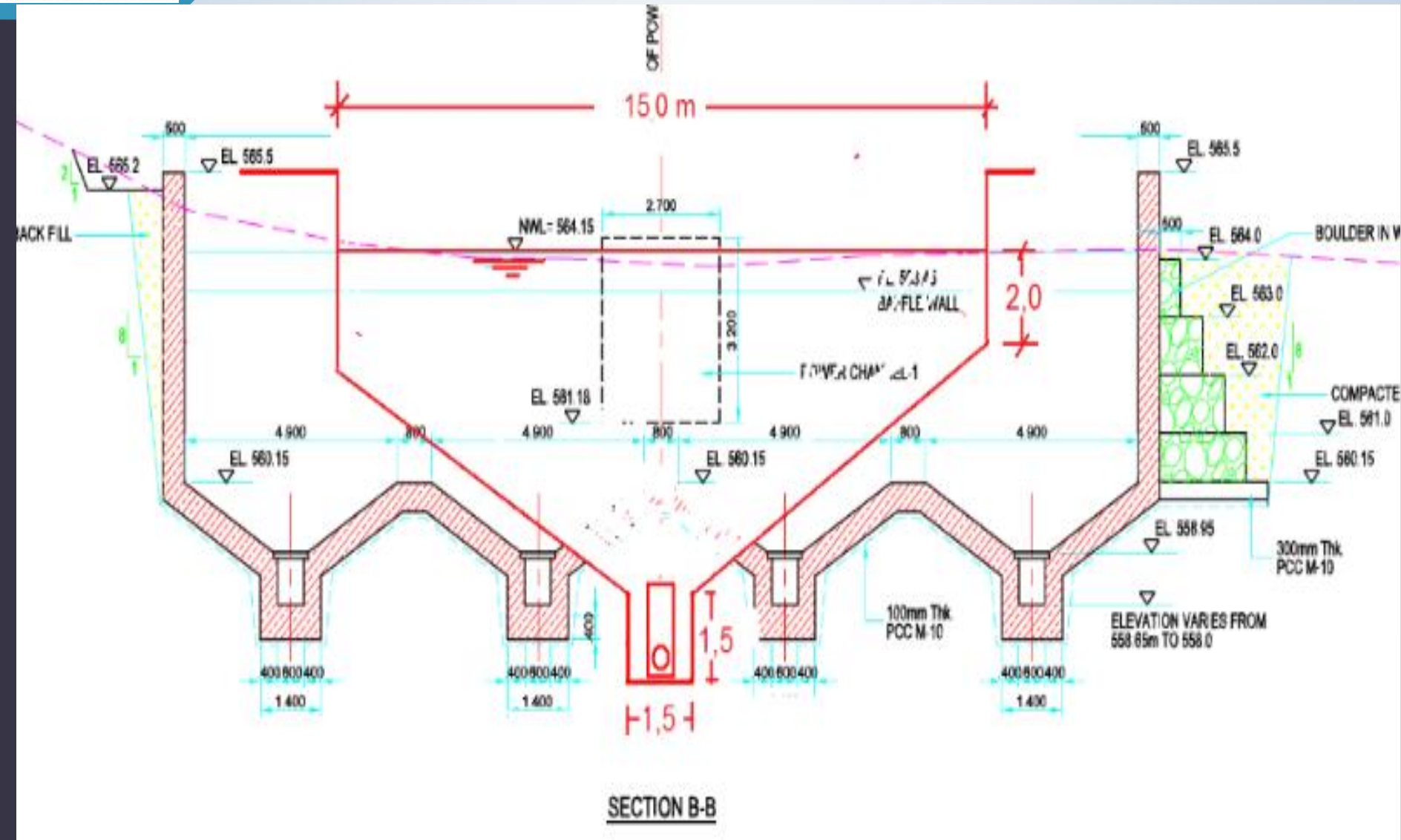


- Hydro Design together with its European partner SediCon design and supplies Sediment removal systems hydro power projects, irrigation projects etc.
- The European partner has more than 20 years of experience in various countries such as India, Canada, Chile etc in design and supply of Sediment removal systems.
- We have 6 projects in Nepal and two of them have been in operation without any issue. We have supplied our system to 60 MW Khimti in 2000 which has been working without any maintenance.

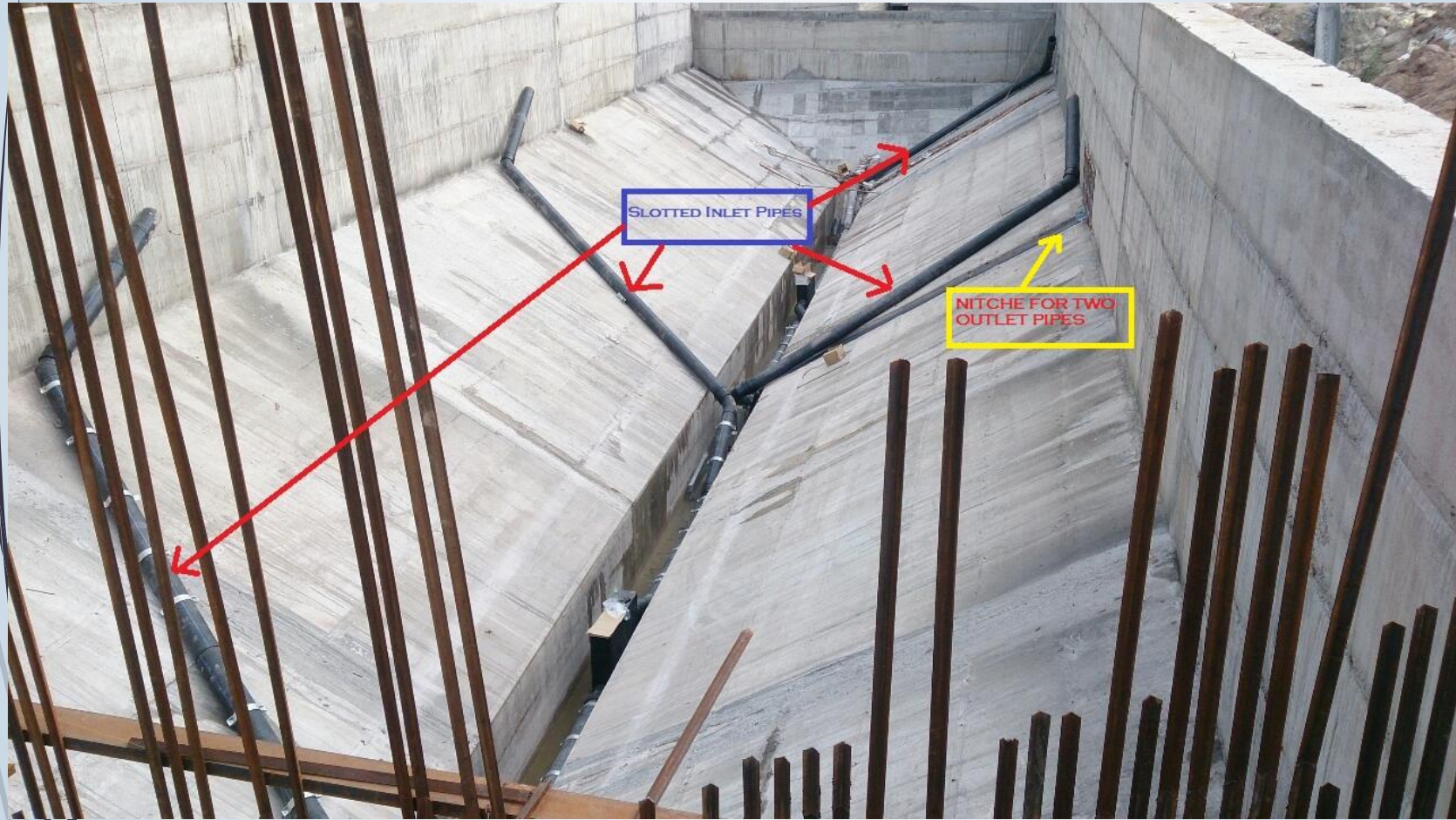
Silt Flushing System in 6 Baner Sangam HEP, India

- Location: Baner River, Kangra, Himachal Pradesh
- 6 MW: Head 42 meter, Discharge 17 Cumecs
- Desander Design Optimized – 2 double Dufour to 1 chamber
- Two SediCon Sluicer Units, one basin of 65 m L, 17.5 m width
- 940 ton/hour removal capacity, particle size upto 80 mm
- Reduced Water Consumption – 3.4 cumecs to 0.7 cumecs
- No movable parts, designed for 50 years life.
- Valves are expected to operate 200 – 250 hours in a year
- Valves can be operated independently or jointly
- Project commissioned in 2015

Silt Flushing System in 6 Baner Sangam HEP, India



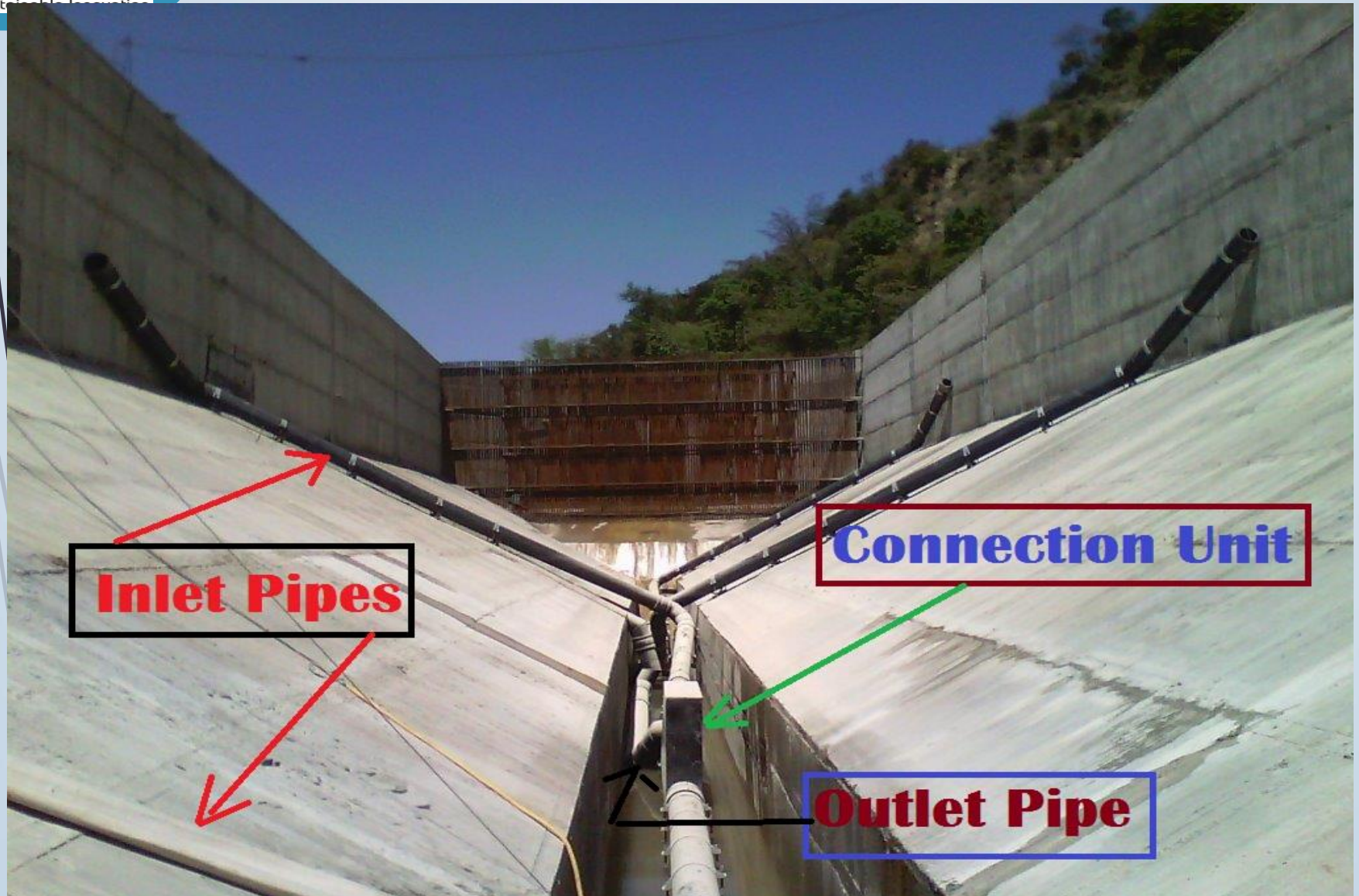
Silt Flushing System in 6 Baner Sangam HEP, India



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Silt Flushing System in 6 Baner Sangam HEP, India



Silt Flushing System in 6 Baner Sangam HEP, India



Silt Flushing System in 6 Baner Sangam HEP, India



Silt Flushing System in 7.5 MW Indrawati 3 HEP, Nepal

- 7.5 MW Hydropower plant has been in operation for more than 15 years. Discharge 14 cumecs.
- Designed with one chamber which traps the sediments but does not remove, thus manual removal for many years.
- Project has tried to install extra pipes for removal but it did not work
- We proposed to install two Silt Flushing Systems to remove sediments from the main desander.
- We also installed one dredging unit to remove sediments from transition area which is around 40 m length

Desander Picture of 2013



Installation of Two Silt Flushing Systems – Apr 2017



Installation of Dredging System – Apr 2017



Silt Flushing System – Video 2018 Monsoon



Cost Benefits – Silt Flushing System

- Design Optimization possibilities resulting in cost savings on account of reduced civil works and hydro mechanical works like gates and hoists.
- Typical cost saving is in the range of 10 – 15% of the conventional cost.
- Multiple flushing outlets leads to efficient removal of trapped sediments
- Reduced water consumption for flushing, meaning increased power generation.

Trash Rack Cleaning System



Trash Rack Cleaning Machine (TRCM)

- Hydro Design together with its associates based in India design, supplies, erection, testing commissioning of electrically operating Trash Rack Cleaning Machine.
- Our associate has been in the business of supply of TRCM for more than 30 years and the very oldest TRCM has been in working condition in India for 30 years now.



TRCM – Working Methodology

- The Trash Rack Cleaning Machine is wire rope operated type of machine with mechanical and hydraulic controls to effectively remove the trash from the stationary trash racks.
- The machine shall have a platform resting on steel fabricated pedestal moving on End carriages. The Hoisting mechanism is fixed on this platform.
- Operators cabin is fixed on one side with the Electrical / control panel and the operators seat. The Operators cabin shall be so placed so that the operator can see the trash racks and the rake being hoisted.
- The machine runs of the rail lines fixed on the bridge and operates to the entire length of the intakes.

TRCM Video



TRCM Video



TRCM Video



TRCM – Cost

- Cost of TRCM varies from project to project because it is based on specific project design.
- The price range can vary from INR 50 Lacs to INR 100 Lacs

Contact Us

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