



How can civil engineering contribute to a better environmental integration?

How can the construction costs of civil works be reduced?

How the efficiency can be increased by an appropriate civil engineering?





How can civil engineering contribute to a better environmental integration ?

- Go underground where possible (covered structures)
- Reduce height of structures (ungated weirs if possible)
- Avoid installation of trashrack cleaning machines (self-cleaning trashracks)
- Design fish-passes as small river with large boulders (rapid - pool system) with appropriate minimum discharge
- Avoid construction of new access roads (choice of site)
- Open air penstocks without expansion joints (no need for maintenance ad access roads)
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How can the construction costs of civil works be reduced?

- Improve overall design (general conception)
- Develop standardized civil structures (especially intakes and weirs)
- Use alternative material and concepts (rubber weirs, PVC or Glass Fiber Reinforced Plastic penstocks, a.s.o.)
- Avoid river diversion works during construction (overall design, prefabricated structural elements)
- Develop alternative flood safety concept (e. g. fuse plug spillways, slide gates lowering in the body of the weir instead of raising up in case of flood)
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How the efficiency can be increased by an appropriate civil engineering?

- Civil engineering can't be neglected (competent designer required)
- Improve the design of intakes (high diversion rate and better handling of sediments and floating debris)
- Develop simple devices for water level control upstream of weirs
- Reduce head losses by compact design
- Reduce operation cost by innovative overall design
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