The outline of Tsuruda Dam redevelopment
The outline of Sendaigawa River and Tsuruda Dam

- Sendaigawa is the 2nd longest river in Kyushu. The main river length is 137 km and the river basin area is 1,600km².
- The average annual rainfall in this river basin is 2,800 mm.
- A lot of flood damage happened on this river from the old days.
- Tsuruda Dam is for flood control and power generation. It was completed in 1966.
- The height is 117.5m, the catchment-area is 805km², the pondage is 123,000,000 m³ and it is the highest dam in Kyushu as gravity dam.
The natural environment around Tsuruda Dam

The Sendaigawa river basin is the area where much rain occurs and also the flood occurs frequently. On the other hand, Sendaigawa is blessed with the abundant nature. There are specialty products which used high quality water and the tourist attractions which utilized nature around Tsuruda Dam.

“the Sogi Falls” which is called Oriental Niagara

Firefly watching

the Sogi powerplant ruins

Tsuruda Dam

“shochu” which used high quality water
The damage by the flood in July, 2006

The situation of damage

<table>
<thead>
<tr>
<th>name of municipality</th>
<th>inundation above floor level (house)</th>
<th>inundation under floor level (house)</th>
<th>total</th>
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<tr>
<td>Satsumasendai City</td>
<td>91</td>
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<td>Satsuma Town</td>
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<td>232</td>
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<td>301</td>
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<td>Yusui Town</td>
<td>446</td>
<td>123</td>
<td>569</td>
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<td>Ebino City</td>
<td>229</td>
<td>179</td>
<td>408</td>
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<tr>
<td>total</td>
<td>1,848</td>
<td>499</td>
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the rescue operation by the Self-Defense Force
The average rainfall of the dam upstream region

The flood control by Tsuruda dam about the flood at July, 2006

maximum inflow about 4,040 m³/s

maximum flood control capacity about 2,000 m³/s

inflow = outflow

inflow > outflow

We shifted to "the special operations handling the flood over the planned scale"

Tsuruda Dam accumulated the flood of 75,000,000 m³ and reduced flood damage.
We’ll lower a reservoir level, and will increase the flood control capacity from a maximum of 75,000,000 m³ to a maximum of 98,000,000 m³.

We’ll add outlet conduits in the position which is lower than now.

The enormous damage in July, 2006 became the opportunity which Tsuruda dam redevelopment begins with.

We set about this project on April, 2007 to reduce flood damage on the Sendaigawa river basin.

- We’ll lower a reservoir level, and will increase the flood control capacity from a maximum of 75,000,000 m³ to a maximum of 98,000,000 m³.
- We’ll add outlet conduits in the position which is lower than now.
The overview of the construction

We’ll conduct these construction while maintaining the feature of the present dam.
The plane figure

We considered an influence over the powerplant on the left bank and the slope drilling on the right bank. We decided the best shape of the energy dissipation.

Replacement power generation conduits
Remodelling of the existing energy dissipation
Additional energy dissipation
Additional outlet conduits
Slope excavating
We’ll make five holes with the additional outlet conduits and the replacement power generation conduits.

Tsuruda Dam redevelopment is one of the largest dam redevelopments in Japan.
To secure the safety of the construction in the reservoir, we avoid flood season as much as possible. In addition, we will lower a water level than usual.

**STEP1**
- The construction operation water level ($WL=133\text{m}$)
- A foundation concrete
- We establish a scaffold

**STEP2**
- The construction operation water level ($WL=133\text{m}$)
- Dam–body drilling
- We will establish a temporary cofferdam

**STEP3**
- The temporary cofferdam will be removed
- The construction operation water level
- $WL=\text{almost 120m}$
- We will install a bell–mouthed entrance
- We will install a regulating gate

**STEP4**
- $WL=160\text{m}$ or less
- We will install an outlet conduit or a power generation conduit
The plan of the construction of the conduit

we’ll plan to do the construction of the outlet conduit and the power generation conduit, dividing it into the following two steps.

**STEP1.** We will build No.1 replacement power generation conduit and No.2 additional outlet conduit at the same time.

**STEP2.** We will plan to build No.2 replacement power generation conduit and No.1 and No.3 additional outlet conduit.
The Saturation Diving is the following method. The diver must live at the residential space of the atmospheric pressure which is the same as the working water depth during the working term. The diver is decompressed in the work end and return to the atmosphere pressure.

The diver must stay at the deck decompression chamber about 1 month.

Because we must work at 65 m water depth in maximum, we adopt "the Saturation Diving" for the increase in efficiency of the work and the safety of the diver.
We expect that the necessity of the dam redevelopment becomes increasingly bigger in the future.