Hydraulic model tests for the spillways of the Shahryar dam (Ostour, Iran) - 2005

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The model of the Shahryar dam located on the Ghezel Oezan River represents the dam with its two spillways and upstream and downstream parts of the valley. The scale factor chosen for the study was 1:65. Large dimensions of the model permit to represent the real flow behavior during floods over the dam and also downstream (figure 1).

Figure 1 Physical model representing the reservoir, the dam, the spillways and the plunge pool

On the upstream part, the aim of hydraulic model tests was to verify the well behavior of spillways. For this, different measurements were carried out:

- Rating curve of the two spillways with adjustment of analytical relations
- Upstream velocity field (figure 2)
- Water elevation along the guide walls, piers, chute and flip bucket
- Pressures on the weir, flip buckets and splitters of the gated spillway (cavitation risk)

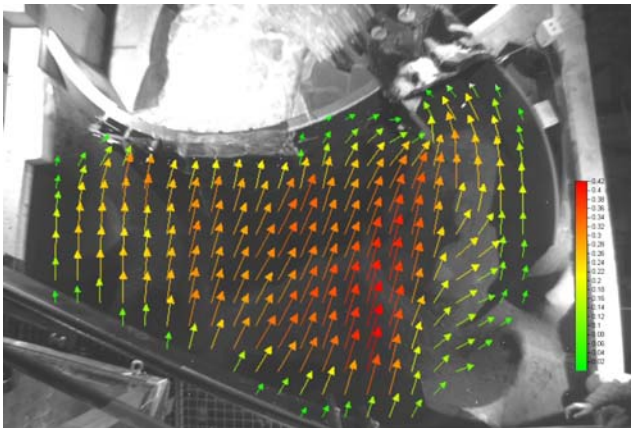

Figure 2 Velocity field in the reservoir for Q_{1000}, measured with "Particle Image Velocimetry"

The upstream hydraulic investigations showed in particular a flow behavior problem along the left guide wall of the gated spillway: dangerous vortices with important water surface oscillations involved bad flow conditions on the chute and the flip bucket. Several alternatives were proposed to solve this problem using in particular a vertical inclination of the left guide wall (figure 3).

Figure 3 Flow behavior at the left bay of the gated spillway for a vertical wall (initial geometry, left) and an inclined wall (right)

On the downstream part of the dam, different parameters and phenomena were studied concerning the jets issued from the spillways and the scouring risk in the plunge pool:

- Trajectories and impacts measurements of the jets issued from the two spillways
- Dynamic pressure measurements at jets impacts in the plunge pool
- Investigation of the velocity field describing the main flows and rollers (figure 4)

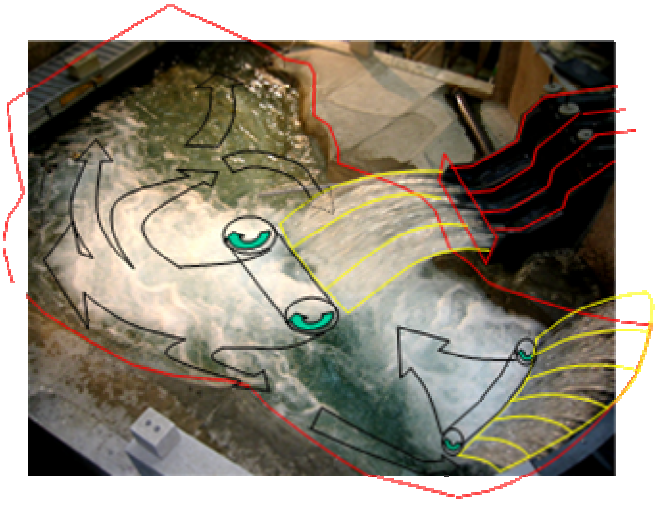

Figure 4 General flow pattern in the plunge pool for high floods (Q_{500} to PMF)

These different measurements were carried out for a range of characteristic discharges. Results of this study will be used by the project engineers for the final design of the spillways and the plunge pool.