Stilling Basin Performance Analysis by ADV

Seyed Sobhan Aleyasin, University of Manitoba
Nima Fathi, University of New Mexico
Peter Vorobieff, University of New Mexico

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Seyed Sobhan Aleyasin, Nima Fathi, Peter Vorobieff

Department of Mechanical Engineering
University of Manitoba, CA
University of New Mexico, US
Motivation

- Stilling Basins placed at outlets of canals, chutes, culverts.
- Their studies date back to 1950s.
- The aim is designing shorter and more efficient basins.
- USBR standard is one of the earliest ones.
- This presentation is focused on type VI of this standard.
Motivation

Some of other designs

• Hook stilling basin.

• Vollmer and Khader designed An stilling basin for low tail water.

• Garde placed various splitters, they chose type c as the best ones (Type c is similar to our splitter)
Experimental setup

- Plexiglas flume, 3.7 m long, 0.4 m wide and 0.6 m deep
- According to USBR VI at Fr = 6, W = 40 cm, L = 52 cm
Experimental setup

- ADV used
- Measurement at 9 points
- Measurement at 3 Fr
Experimental setup

- Test R is USBR VI
- 3 type splitters were placed in front of inlet pipe (d/2 from inlet, where d is end sill height)
- A perforated baffle was used at 2 various position (Test 4 and 5)

<table>
<thead>
<tr>
<th>Test</th>
<th>Splitter type</th>
<th>Cellular baffle type and placement</th>
</tr>
</thead>
<tbody>
<tr>
<td>R</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>1</td>
<td>Type 1, 3.4 cm from inlet</td>
<td>None</td>
</tr>
<tr>
<td>2</td>
<td>Type 2, 3.4 cm from inlet</td>
<td>None</td>
</tr>
<tr>
<td>3</td>
<td>Type 3, 3.4 cm from inlet</td>
<td>None</td>
</tr>
<tr>
<td>4</td>
<td>Type 2, 3.4 cm from inlet</td>
<td>40 cm from inlet, on bottom</td>
</tr>
<tr>
<td>5</td>
<td>Type 2, 3.4 cm from inlet</td>
<td>33 cm from inlet, on bottom</td>
</tr>
</tbody>
</table>
Results (Tests R & 1)

Test R

Test 1
Results (Tests 2 & 3)
Results (Tests 4 & 5)

Test 4

Test 5
Results

• Splitter type 3, Vx much lower, suggesting a nearly stagnating (less desirable)
• Splitter type 1, negative velocity near the bottom.
• Splitter 2 shows better performance
• Tests 4 and 5 are quite similar and the differences are related to proximity of cellular baffle to measuring points
Results

- Figures are corresponded to Fr = 6 (results for other Froude numbers are similar).
- The presence of the cellular baffle leads to lower Vyz and consequently better kinetic energy dissipation.
- Near the basin floor, the lowest Vyz occurs in test 2 (splitter type 2).
- The combination of a cellular baffle and splitter type 2 added to USBR basin type VI leads to the calmest flow and best energy dissipation among the configurations we tested.
Conclusions

Studying flow in several stilling basins shows that:

- Adding splitter (type 2) improve the basin’s efficiency
- Placing cellular baffle near the basin bottom enhances the performance
References


Questions?