Large scale experimental study of piano key weirs

Olivier Machiels (speaker), Sébastien Erpicum, Pierre Archambeau, Benjamin J. Dewals* and Michel Piroton

University of Liege
* Belgian Fund for Scientific Research FNRS
Piano Key Weir (PKW)

- Until four times more efficient than a traditional Creager
- Reduced basis length which permit a direct use on dam crest
- Complex geometry which induce a large set of variable parameters
- Lacks of understanding about flow conditions
Introduction

Goals and strategy

Experimental set-up

Results: Release capacity

Low heads behavior

Conclusion

First realizations

Experimental knowledge

Design by extrapolation of existing experimental results

Modification of the geometry following the project engineers ideas

Scale model study

Efficiency?

Realization

Need of efficient design rules based on the hydraulic behaviour of PKW

http://www.hach.ulg.ac.be
**Goals and scientific strategy**

**Understanding of the physics**
- Large scale model
  - To define:
    - Interests and limitations
    - Mean parameters

**Influence of the geometrical parameters**
- Scale models with variable geometries
  - To define:
    - Most important parameters
    - Influence on release capacity
- Numerical modeling

**Physically based analytical formulations**
- Design of new structures
Release capacity

\[ Q = C_w W \sqrt{2gH^3} \]

Wall thickness influence

Low heads behavior

Experimental set-up

Results: Release capacity

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http://www.hach.ulg.ac.be
**Low heads behavior**

- **H/e < 2.5**
  - Attached flow

- **H/e > 2.5**
  - Air bubbles

**Goals and strategy**

**Results: Release capacity**

**Conclusion**
**Low heads behavior**

- **H/e < 2.5**
- **H/e > 2.5**

- Low heads behavior
- H/e < 2.5
- H/e > 2.5
Low heads behavior

H/e < 3.5

H/e > 3.5
Low heads behavior

(Lakshmana Rao 1975)
4-years experimental study of PKW

- To improve the understanding of flows over PKWs (Large scale model)
- To determine the influence of the mean geometrical parameters on the release capacity (scale and numerical model)

First results

- Enable to highlight the influence of the crest thickness for low heads
- Consistent with previous published results for sharp crested weirs