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Some comments on PK-Weirs

By F. Lemperière (Hydrocoop France)

On May 7th 2020 IAHR reported that the American Society of Civil Engineers (ASCE) has awarded its Prestigious “Hydraulic Structures Medal” to D^r Erpicum from the IAHR and the Liege University in Belgium for “His significant contributions in the areas of piano keys weirs spillways design and organization of International Labyrinth and PK-Weirs Workshops”.

In the corresponding comments it was said that “PK-Weirs were first presented by F. Lemperière in 2001”. As there was no other reference to the many actors of the PK-Weirs success I feel useful to draw attention on the key role of some of them which is often overlooked.

Many technical worldwide successes in the past have been mainly attributed to most industrialized countries; the role of Asia and Africa was often overlooked. The merits of D^r Ouamane from the Hydraulic Laboratory of the University of Biskra (Algeria) in the invention and relevant basic designs of PK-Weirs are the same as the merits of Hydro Coop (F. Lemperière, J.P. Vigny, P. Blanc) but his name and his Laboratory have been often forgotten.

And the key role of E.D.F (F. Laugier) for implementing many PK-Weirs (including first ones) and for many relevant technical progresses is more known than a similar role of Vietnam for huge PK-Weirs schemes based upon designs and tests made in Vietnam with advices from Mr Ho Ta Khanh.

Dr Erpicum who had a key role since 2006 in the PK-Weirs improvements and success has fairly acknowledged in an e-mail dated May 13 that he is an Actor within many others and that he has not been involved in the PK-Weirs Invention. Since May 22, the IAHR site precises that PK-Weirs were first presented in 2003 by Dr Ouamane and Hydrocoop.

The history of PK-Weirs invention is detailed in the paper presented end of 2003 by F. Lemperière and A. Ouamane. “The Piano Keys Weirs: a new cost-effective solution for spillways”. It underlines the close cooperation between D^r Ouamane for theory and one hundred hydraulic model tests in Biskra and Hydro Coop for structural and construction problems and economical optimization.

The name itself of Piano Keys Weir well adapted to the rectangular specific shape was proposed by Claude Bessière from France who was previously much involved in the success of Fusegates.

Before 2000, few dozens of labyrinth spillways had been built worldwide with a design specific to each designer usually based upon vertical walls and same triangular or trapezoidal shape from upstream to downstream. Some very large ones as UTE (U.S.) required huge quantities of reinforced concrete.

After 2005 a very large part of world labyrinth spillways have been PK-Weirs; their design was most often based upon the models A or B proposed in 2003 by Hydro Coop and D^r Ouamane.

Much analysis and mathematical evaluations, and many improvements have been added since 2005, by Hydraulic Laboratories, Universities and Consultants and by practical experience for construction.

In 2004 the Biskra University created a specific Laboratory for research, studies and tests for Spillways and PK-Weirs under the leadership of D^r Ouamane. Many reports of specific progresses were published and often overlooked. Part of studies was made in cooperation with Hydro Coop, not only for PK-Weirs but also for Concrete Fuse Plugs (such as used in Burkina Faso) and for the very cost-effective association of Fuse Plugs with PK-Weirs, and now for the promising use of Fuse Steel Plates.

A very important contribution was from the Hydraulic Laboratory of EDF (LNH Chatou in France) not only for many tests at Hydro Coop Request before 2003 but from 2004 for much research, specific proposals and various tests (M. Cicero).

The Ho Chi Minh and Hanoi Laboratories had since long time much activity on Labyrinth spillways and since 2005 on PK-Weirs studies and tests for huge schemes in Vietnam.

The Roorke University in India was involved in PK-Weirs with Hydro Coop before 2003 and for Indian use after 2005 some tests were made in IWRH Laboratory (China) before 2003.

Since 2006 much very useful theoretical and practical research, mathematical evaluation and tests have been made in the Liege Laboratory and reports published since 2009 (Machiels, Erpicum and al.).

A similar very useful contribution of Research and tests has been made by the Hydraulic Laboratory of Lausanne in Switzerland under D^r Schleiss leadership.

Much research and designs have been made since long time in U.S. about traditional Labyrinths and especially in Utah University (Falvey, Tullis,...).

The first Workshop devoted to PK-Weirs was organized by D^r Erpicum in Liege in 2011. Other Workshops were organized by LNH in Chatou in 2013, by Vietnam Authorities in 2017, by the Biskra University in Algeria during the International Conference on Dams in 2018. Liege University, EDF and EPF Lausanne did much contribute to most of them.

I have probably overlooked the contribution of other efficient actors and I apologize.

I try to conclude by some general comments:

- Most Labyrinth Weirs since a dozen years are PK-Weirs.
- Many PK-Weirs are based on 2003 proposals from D^r Ouamane and Hydro Coop.
- PK-Weirs have a huge success of research, Studies and Tests and the basic designs were much improved by Enthusiasts and Competent Actors.
- PK-Weirs have a huge world potential. This potential has been well used for existing dams in France, and for new Dams in Vietnam but elsewhere for a very small part of the potential.