

Interactive comment on “CFD simulations to optimize the blades design of water wheels” by Emanuele Quaranta and Roberto Revelli

Anonymous Referee #1

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My major comment to this paper is that the experiments are not explained in detail, so that the interpretation of the values of the numerical simulations is not traceable. It is important to give details about how and with which measurement devices torque, rpm, flow and hydraulic heads are measured and to now the uncertainties of these devices. Are the measured values validated? It seems to me that the difference between the experimental and the numerical results might be within the uncertainties of the experimental setup and thus the impact of the different forms of the blades on the torque and with this on the efficiency and the power may not be really distinguishable. Please validate the measurement data and show the results in the paper.

My other comments are: line 15 Why is hydropower considered as one of the most important renewable energies? line 17 How long is a long payback time? line 17 Incorporate the EU Water Framework Directive (2000); this is the official document

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on which the continuity of rivers and streams is specified. line 20 “... are still not exploited ...” This needs to be considered more differentiated. There have been thousands of small mills up to about 100 years ago and then got neglected as turbines (that could also transform higher flows into electricity) and generators were invented. So, many of the sites have been exploited but are nowadays neglected. line 29 “... The upstream water level can be controlled...”. why “can”? Are there other ways to control the water level? line 41 Why are water wheels environmental friendly? How do you define this? Is this proven? If so, please quote. line 93ff Why have you chosen exactly this curvature for the modified blade profiles? Is there any resemblance to other blade profiles e.g. Zuppinger Wheel blades? line 129: “...an optimal radius can be considered...” maybe was considered is more correct? Did you utilize $r = 0,25\text{m}$? Or could it be another value? table 1 I am sorry, but I cannot reproduce some of the calculated values (namely -1,16%, 5,4% and 5,7%). Please consider: would it be more feasible to compare in column 7 ($C_{\text{exp-C1}}/C1$), so that all percentages are investigated from the same basis? line 198/199 The values in the text are not identical with the values in table 1.

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