Summary of the deliverable D4.3: Model application to ship hull – propeller flow

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In the present work, it is hypothesized that the vapor structures, which are in contact with the surface, are much more aggressive than any other structure, no matter how close they are to the wall. Thus, we assume that the direct impact on the surface face from the structures touching the surface, is much higher than the one from any other structure away from the surface. Therefore, it is not required to calculate the distance and the projection of any vapor structure, giving us an erosion risk assessment with no additional computational cost. A verification and validation study are conducted on the Delft Twist 11 hydrofoil, followed by an estimate of the cavitation impact distribution on the surface. The effect of the pressure field driving the collapse on the distribution of the initial potential energy to the surface is identified and two erosion risk indicators are used to assess the flow aggressiveness. It is further hypothesized, that the investigation of the erosion risk on the propeller blades in behind condition, does not require the use of the ship hull. An inlet boundary condition, that describes the inflow to the propeller in a similar way as if it operates behind the hull, is considered as sufficient. Thus, the same model is applied on the KCD-193 model propeller operating behind a wakefield. In both test cases, the impact distributions show a good agreement with the damage patterns obtained from paint tests, when we account for the effect of spatial pressure recovery, as the driving pressure, by time averaging the local pressure field. High erosion risk is found in all regions identified by the experiments.

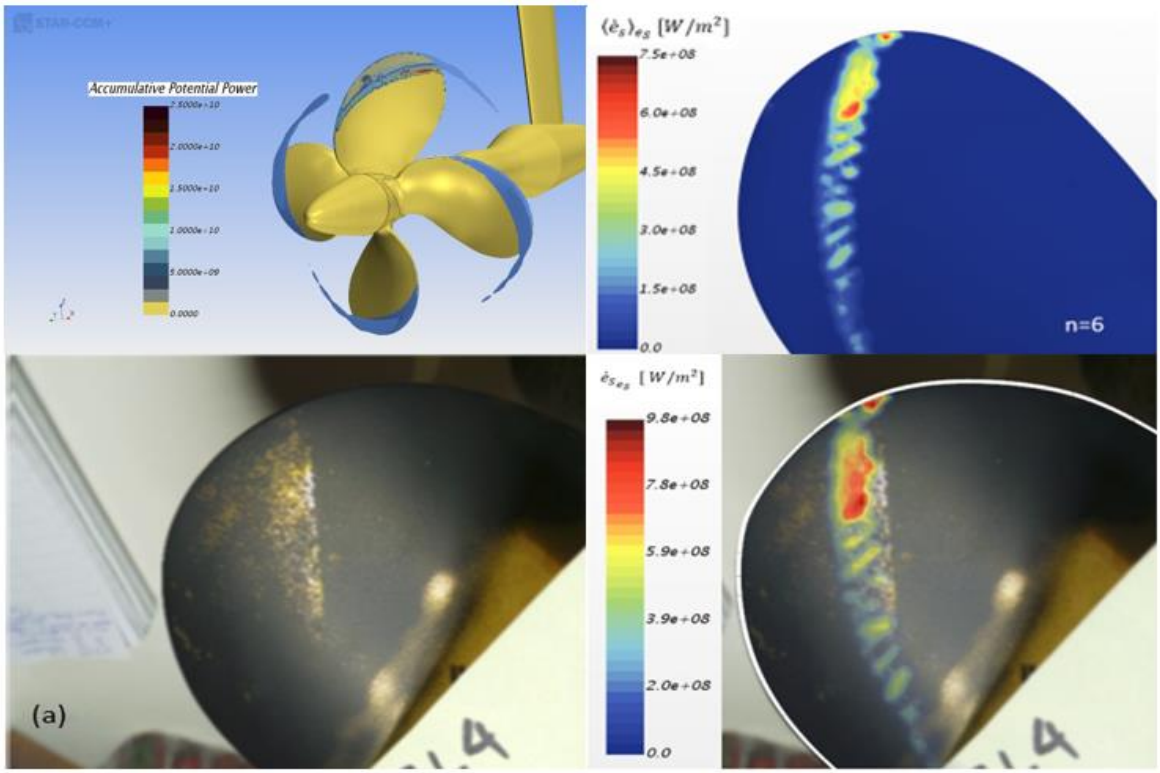

Figure. 1 Cavitation development and erosion risk assessment on the KCD-193 model propeller. The accumulative potential power on the blade (top left), the aggressiveness indication on the blade (top right), the erosion pattern obtained from the paint test (bottom left), and the comparison of the CFD solution with the indicated damage areas (bottom right) are shown.