5 CONCLUSION

As the Test Contributors are prominent and experienced researchers in the field of cavitation erosion, the intention of the author of this report has been rather to present the systematically ordered experimental material than to spread his own interpretation of the results. Nevertheless it is clear that an impact of such an interpretation on the method of data processing and presentation as well as preliminary analysis was unavoidable.

It is the hope of the author that the results and opinions presented in this report will provoke a major discussion at the ICET Seminar to be held in 1999 and prompt further efforts towards development of generally accepted and compatible methods of assessing materials resistance to cavitation erosion. In order to enable such a discussion basing on the data free of any previous interpretation a database software has been developed. As already mentioned, the EROSION database comprises all the raw data stored in a way enabling easy exchange with data processing tools at the disposal of the user.

The statements above do not imply the wish of the author to withdraw conclusions reflecting his point of view from the planned discussion. These conclusions can be summarised as follows:

1. The differentiation of cavitation erosion test results depends both on test conditions and the material tested. The highest differentiation can be observed in case of cavitation tunnels and rotating disk facilities. Proper interpretation of the differences observed does not seem possible without detailed analysis of cavitation pulses and erosive effects exerted by the individual fractions of the cavitation loading distribution.
2. Quantitative assessments of cavitation resistance based on traditional single-number parameters, like $MDPR_{max}$, IER_{max}, and incubation period can lead to ambiguous conclusions. The author of this report is convinced that the maximum cumulative erosion rate CER_{max} might be a better choice. Its main advantages can be summarised as follows:
   - CER_{max} parameter characterises mean material performance in the most significant period of erosion.
   - Application of the $\Delta V = CER_{max}\ t$ dependence instead of the experimental volume loss curve leads to reasonable, yet conservative (safe) extrapolations,
   - Calculation of the $CER = CER(t)$ curve is simple and almost free of uncertainties unavoidable when plotting the $IER = IER(t)$ dependence.

   Due to reasons above, it should be strongly recommended to conduct each erosion test at least until the CER_{max} value is attained. Due to low erosion rates this was often not the case during tests conducted under the ICET programme.
3. Vibrating specimen vibratory rig designed and run according to the ASTM Standard G32 (CISE) shows erosion rate comparable with that of the highly efficient rotating disk facility (IMP) and the liquid jet impact device (SIGMA). The advantage is relatively high erosion rate of highly resistant metals and "reasonably" high rate of erosion of soft materials. This feature can lead however to discrepancies with results at flow facilities whenever any quantitative analysis is attempted.
4. The FCRI cavitating jet cell, designed and run according to the ASTM Standard G134, shows erosion rate comparable with that at efficient cavitation tunnels. Unambiguous ordering of test materials follows from results presented.

5. Due to reasons mentioned in paragraph 2, rigs enabling to test simultaneously several specimens under the same severe cavitation conditions seem especially well suited for industrially oriented tests. The rotating disk rig with bolt cavitator and specimen inlaid in the disk surface (IMP) shows cavitation erosion intensity comparable with that of the liquid jet impact device and allows simultaneous tests of 8 specimens which justifies its recommendation as a basis for future standardisation.
6. The Erdmann-Jessnitzer test chamber at the University of Hannover allows excellent control of erosion rate and distinct differentiation of test results. Due to its design and operating features the chamber is especially well suited for research purposes and can be recommended as a basis for future standardisation of cavitation tunnels.
7. Despite statements expressed in two previous paragraphs, the author of this report is rather sceptical about effectiveness of standardisation efforts concerning large flow installations. Some reasons of this scepticism have been explained in section 1.
8. Results of the ICET project have convinced the author that in addition to standardisation efforts one should strive to develop methods allowing to predict material performance under prescribed cavitation loading. In experimental practice this can imply determining material resistance characteristics basing on tests performed under different, but strictly controlled cavitation conditions.

Nomenclature

A	-	eroded area,
CER	-	Cumulative Erosion Rate, $CER = \Delta V/t$
$CMDPR$	-	Cumulative Mean Depth of Penetration Rate, $CMDPR = MDP/t$
$CMaxDPR$	-	Cumulative Maximum Depth of Penetration Rate, $CMaxDPR = MaxDP/t$
IER	-	Instantaneous Erosion Rate, $IER = d(\Delta V)/dt$
K	-	cavitation number of a cavitation tunnel, $K = \frac{p_u - p_v}{0.5\rho v^2}$
K'	-	cavitation number of a cavitation tunnel, $K' = \frac{p_u - p_v}{p_u - p_d}$
MDP	-	Mean Depth of Penetration, $MDP = \Delta V/A$
$MaxDP$	-	Maximum Depth of Penetration,
$MDPR$	-	instantaneous Mean Depth of Penetration Rate, $MDPR = d(MDP)/dt$
$MaxDPR$	-	instantaneous Maximum Depth of Penetration Rate, $MaxDPR = d(MaxDP)/dt$
p_u	-	upstream pressure,
p_d	-	downstream pressure,
p_v	-	saturated vapour pressure,
t	-	cumulative test duration,
v_∞	-	undisturbed flow velocity,
ΔV	-	volume loss,
ρ	-	liquid density,
σ	-	cavitation number of a Lichtarowicz cell, $\sigma = \frac{p_d - p_v}{p_u - p_v} \approx \frac{p_d}{p_u}$
τ_{inc}	-	erosion incubation period defined by the intercept on the time axis of a straight line tangent to the volume or mass loss curve at their maximum slope point (cf. ASTM G 40-88 Standard [22])

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