

INVESTIGATION OF TRANSIENT RESPONSE UNDER SHOCKLOAD IN A HIGH SPEED SEPARATOR WITH NONLINEAR SUPPORT ELEMENTS

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ABSTRACT

High speed separators used in naval ships are required to be tested with shock load and to be certified for shock resistance. ALFA LAVAL experience of separator operations shows that contact or rubbing between rotating a bowl and a frame hood at full speed could cause severe damage to the separator. In order to prevent this kind of contact under shock testing, it is very essential and important for us to predict rotor vibration amplitude under various shock loads. This paper describes a computational model predicting the transient response of a rotor and a frame of a separator under a shock load. There are three main major difficulties in solving transient response of a high speed separator. These are 1) Ill-conditioned matrices need a carefully selected numerical method in order to obtain numerical convergence; 2) Nonlinear effect of some supporting elements occurs because of large vibration amplitudes of the rotor and the frame; 3) Damping values play a key role in transient response of the separator. However it is extremely difficult to get a good damping model. A shock test on one of our newly developed separators has been carried out and the results from the computation and the testing have been compared. The comparison gives us sufficient information on how to perform the transient calculation for our separators with the same shock requirement.

Keywords: high speed separator, transient response, shock load, nonlinearity and rotordynamics