How to check P7 pump flow

P7 pump is a closed loop feedback control system. System pressure is the feedback signal. Under high demand conditions, pressure drops, a hydraulic actuator moves the swash plate to deliver more flow and maintain pressure. Conversely a drop in demand causes pressure to rise and the swash plate angle is reduced to reduce flow.

Pump flow is one of parameter when we design the low dwell sweep, the pump flow and force relationship is given by equation 1

$$F_p = \pi^2 \frac{M_{rm} Q}{A_p} f \qquad (1)$$

M_{rm} :mass weight kg, A_P : Piston area m^2 , Q : flow m^3/s

Other limiter parameters is mass stroke Xrm when we design the low dwell sweep, the mass stoke and force relationship given by equation 2

$$F_P = 2\pi^2 M_{rm} X_{rm} \qquad (2)$$

For AHV-380, the mass weight is 5910kg, piston area is 167.23cm^2, pump flow is 0.01009m^3/s ,mass stroke is 0.099m , If the flow and displacement constraints are combined to solve the maximum peak force , one might be able to sustain a set of graphs as shown in Fig. 1

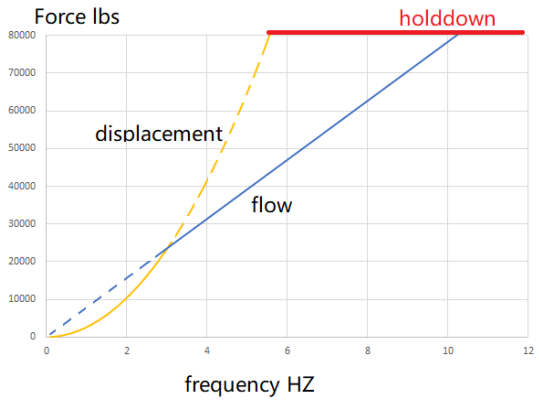

Fig 1 AHV-380 Low frequency constraints for Sinusoids

From the graph we can find AHV-380 at 11hz the peak force will be 80000lbs, ,because it have two P7 pump in AHV-380, one named Aux pump other named VIB pump, so we can use the flowing parameters to verify each of pumps flow: sweep length is 10 seconds, frequency 10-10hz, force setting 50%,-55% type 0.5s.

If the pump flow not enough, the servo valve will more opening, it will cause more distortion, as figure 2. We can find the AUX pump have more distortion and lower force compare the VIB pump, it means the AUX pump have something wrong.

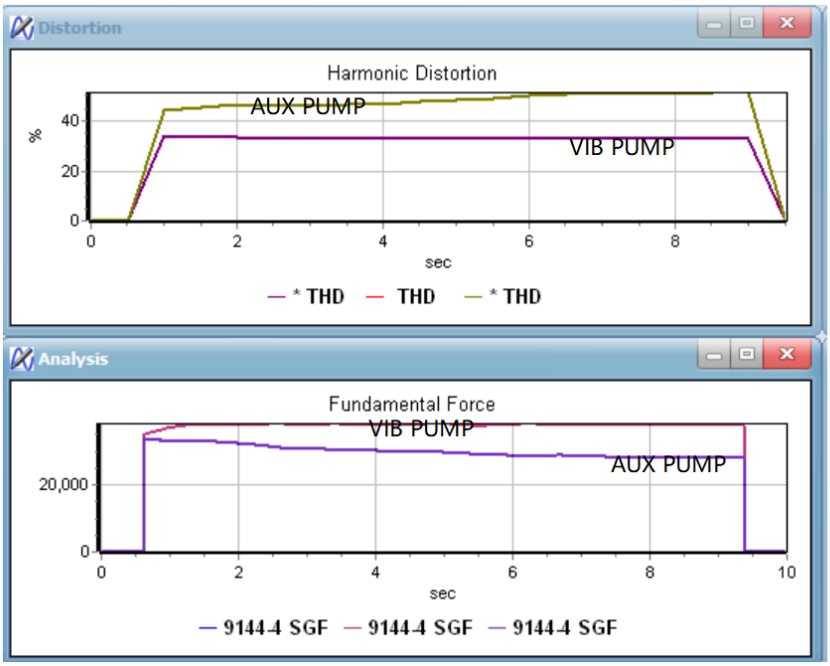

Figure 2 one of the p7 pumps have more distortion

In this paper we take AHV-380 as example, for other kind of vibrator we can check the pump flow in same way, first , let the pump working nearly maximum flow, then (if it have two or three same pumps), can compare each of the pump distortion to verify its flow.