VFD Operation

Variable frequency drive (also referred as VFD, variable speed drive, VSD, or “inverter”) is common in pump operation for energy efficient pump operation by changing pump speed and to control the flow rate and pressure. As introduced in the past TOPPI 36, please understand and use the precautions carefully.

Regarding the performance of the pump, as the Rotation speed/Frequency decreases, “Head”, “Capacity”, and “Shaft power” also decrease. The proportion of this decrease can be approximated by the following relations. (1: At Rated speed, 2: At VFD speed)

- $Flow_2 = Flow_1 \times (RPM_2 / RPM_1)$
- $Head_2 = Head_1 \times (RPM_2 / RPM_1)^2$
- $Shaft\ Power_2 = Shaft\ Power_1 \times (RPM_2 / RPM_1)^3$
- $Pump\ Efficiency_2 = Pump\ Efficiency_1$

If a pump rated at 50 Hz is operated at 25 Hz, the flow rate will be 1/2, the head 1/4, and the shaft power 1/8. Since the difference in pump efficiency is not significant, Tsurumi uses the same value for pump efficiency. Upon request, we can provide performance curves as shown below for different frequencies.