

VFD & it's Uses in Pumping...

1. Principle of VFD on Pumpset's Output :

1.1. The use of VFD will reduce the Frequency of Electrical Power fed to the Pumpset's Motor & hence :

1.1.1. reduce the Motor's (& subsequently the Pump's) Speed Linearly which in turn will :

1.1.1.1. Reduce the Pump's (output) **Flow** in **Linear** proportion (of the Frequency) ..

1.1.1.2. **But** it shall reduce the Pump's (output) **Head** in the **Square** proportion (of the Frequency).

2. Background

2.1. Pumps are generally designed for **Peak Duties** (maximum Head & Flow anticipated) but there maybe times when they'll be required to serve Lower Duties - in such conditions, the use of VFDs seems to be a solution **subject** to the below mentioned **Pre Conditions & Limitations** :

2.2. Pre Conditions :

2.2.1. Unless the System Duty Head (along with Flow) also reduces, merely using the VFD to reduce Flow will not serve any useful purpose...!

2.2.2. If the System Duty Head (along with Flow) also reduces, using VFD to regulate system flow can be a viable proposition

...contact your nearest Aquarian for further assistance

2.3. Limitations :

2.3.1. Bear in mind that All & Any VFDs will always have their Own (internal) Losses –i.e. **VFD's Internal Losses** are an unavoidable parameter which is often overlooked (typically VFDs will have Efficiencies between **93% to 96%**).

2.3.2. VFDs will also introduce Additional Losses inside All & Any (even for VFD Compatible) Motors (by increasing Iron/ Hysteresis, Stray & other losses).

2.3.2.1. Infact as per IEC/ IS; if you use a VFD to drive an IE2 or IE3 motor – the Motor's efficiency will drop down *(by 1 IE Class)* i.e. from IE1 or IE2 level respectively...!

2.4. But, despite introducing additional *(their own)* losses; as since VFDs **may** reduce the mismatch between the Pump's Output (& hence Input Energy Consumption) & System's Demand *(Work to be Done)* - they may help Reduce Wasteful Energy Consumed *(by an unregulated pumpset's Motor)*.

2.5. Bear in mind that VFDs also need VFD compliant Motors – they maybe costlier & more complex to maintain.

2.6. HT VFDs are substantially expensive.

3. Summary :

3.1. The benefits of VFDs are **Superb** when System's Head varies substantially *(with reference to the System's Flow)* & here the use of VFDs should be explored as a Output Regulator *(also serving the dual purpose of a Starter)*

3.2. But, in Systems with Little or no Head variation; the use of VFDs will not help either in Output Regulation or in Energy Savings. Instead, the use of Soft Starters *(FCMA, HFSR, Micro Processor or ATS, Star Delta, etc)* would be an Inexpensive & Effective solution for such cases.

4. Additional Considerations :

4.1. VFDs can serve the **Dual Purpose** of a Motor Starter as well as Frequency Regulator

4.2. But, a Soft Starter is **just a Starter** – it will neither help in Pump Output Regulation nor Introduce Additional Losses into the system.

4.3. VFDs may have some benefits to Reduce Motor InRush kVA & help in Sizing down the kVA ratings of Switchgear or Transformers to an extent but will always do so at the Cost of Additional drop of System Efficiency. ...contact your nearest Aquarian for further assistance