VLTs in Oil Pump Applications

This application note contains a description of the use of VLTs in an oil pump application at the oil company YPF in Argentina. Figure 1 is a drawing of this application.

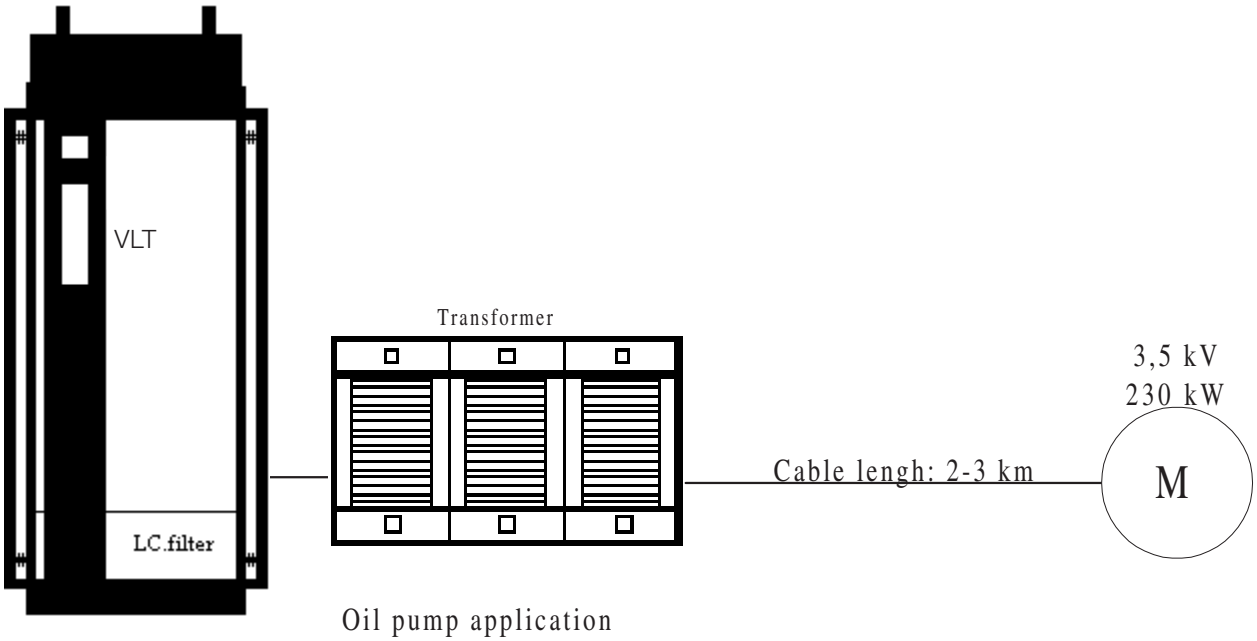

Figure 1

When installing a similar application please note that:

- The VLT 6000 Series cannot be used in this application, because it does not feature the required functions.
- In order to prevent that the transformer is saturated during start up, the VLT must not start at 0 Hz.

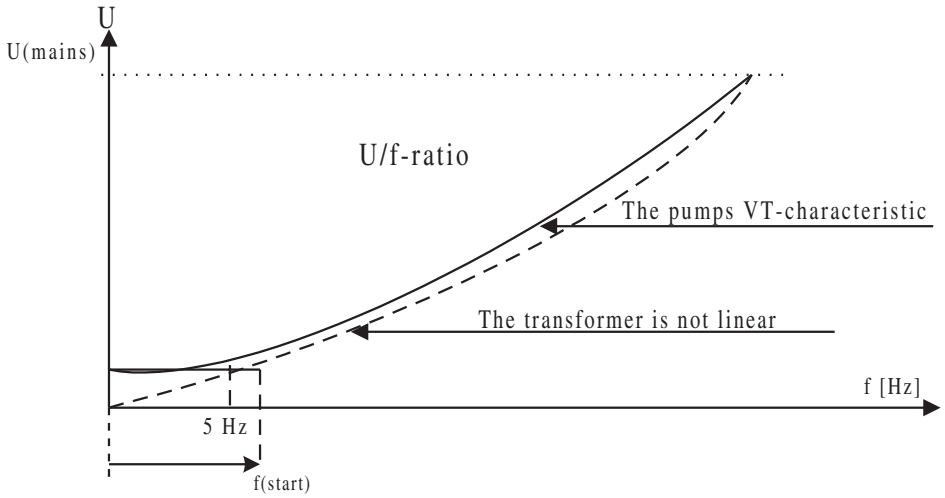

Figure 2, the VLT U/f-ratio

Figure 2, see the frequencies between f_a and f_b. (f_{start} > 0 Hz).

In the application at YPF in Argentina, f_{start} was set to 5 Hz (VLT 5000: parm. 130 and f_{min} at stop parm. 123).

- If a good transformer with low iron losses is used, the LC-filter might not be necessary. It is the current harmonics which may cause thermal problems in the transformer.
  When a poorer transformer is used, an LC-filter is required.

It must therefore be checked that the harmonics do not disturb or cause problems in the transformer. This is done in the following way:

- Go through the whole motor frequency range on the VLT when no motors or secondary motor cables are connected.
- Look at the current in the display to the transformer. It must not suddenly increase and be less than 2-3 % of the motors nominal current (I_N).
- Turn OFF the overmodulation (VLT® 5000: par. 413).
- Check the rotors direction of rotation.

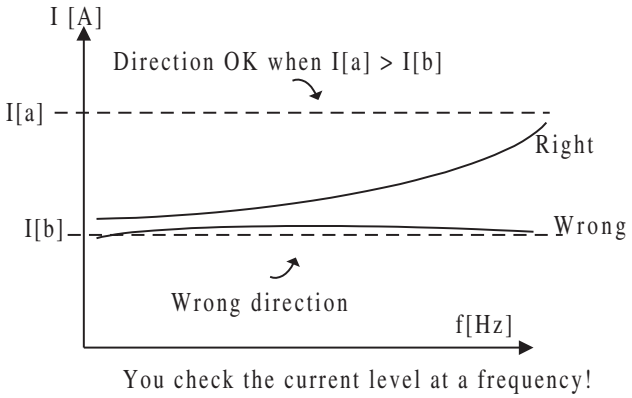

Figure 3, illustrates how to check if the direction of rotation is correct.

- When selecting the right VLT for the application, remember that there is a current loss in the transformer. The loss can be approx. 2-3 %.
- Submerged pumps are cooled by the surrounding media flow. Therefore, at YPF, the minimum pump frequency, f_{min} in parm. 201, had to be set to a speed at which the oil was just coming out of the oil pipe.
- At YPF, restarting the pump was only allowed after 20 minutes. This was done with an external timer.

NB!
Check if there are similar limitations in your pump application.

If the ON-delay is less than 10 minutes, relay 01 on the VLT control card can be used. The Relay 01 ON-delay can be programmed in parm. 324. Relay 01 can then be connected to terminal 18 or 27 and the chosen terminal should then be programmed to STOP. In this way the VLT will not restart before the R01 ON-delay time has expired.

- The transformer will have taped voltage outputs terminals. They can be used to eliminate voltage drops caused by the cable and thereby ensuring the right voltage on the motor terminals. This is done in successive steps on the transformer. The fine adjustment can be done with the VLT output voltage. The VLT output frequency is set to the motor nominal frequency.

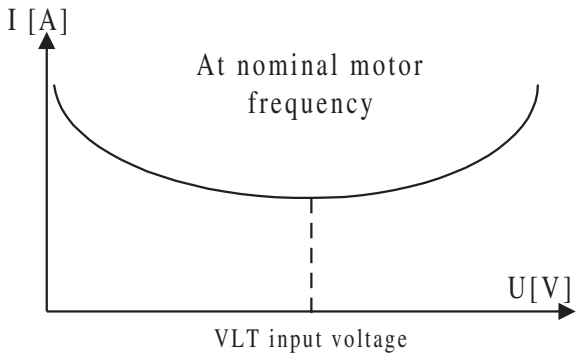

Figure 4, illustrates how to find the right motor voltage.
The right motor voltage is found by adjusting the transformer voltage and then reading the VLT current output. At the lowest value you have the right voltage.