The report of optimisation of the hoisting winch system – the modernisation performed by FAMAK in Jaworzno.

1. The overhead travelling crane has been designed to carry loads up to 100t. The modernisation concerned all drivers of the overhead travelling crane, whereas this description concentrates on the hoisting winch system, which comprises two motors working on the common shaft.

Fig. 1. The overhead travelling crane being the subject of the modernisation. The photograph presents the hook of the main hoisting winch (bigger) and of the auxiliary hoisting winch (smaller).

2. The overhead travelling crane has **two hoisting systems**:
• the auxiliary hoisting winch of load-carrying ability **up to 20t** - **1 motor 37kW**
• the main hoisting winch of load-carrying ability **up to 100t** - **2 motors 18.5kW**

The auxiliary hoisting winch is equipped with a motor of the following characteristics:

Pn=37kW, U=3*380V, In=75A, n=735rpm

The motor is powered by the **VLT® AutomationDrive FC302** converter **with a resistor 40%.** The converter has been standard-programmed for hoisting winch systems. After a short optimisation, achieving the full holding torque during lifting/lowering posed no problems. **The main hoisting winch** is equipped with 2 motors working **on the common shaft**, of the following characteristics:

Pn=18.5kW, U=3*380V, In=39A, n=735rpm

Each motor is powered by the **VLT® AutomationDrive FC302**, with a **resistor 40%.**

Both converters work in an open feedback loop. Speed setting is performed by choosing inner frequencies, with respective values of 25%, 50%, 75%, 100%.

Fig. 2. The common shaft is driven on the both sides. The visible lines keep the hook.

Fig. 3. The motor 18.5kW drives one side of the common shaft. Two drive ratio stages are visible. An identical system is situated on the other side of the shaft.

Fig. 4. The common shaft seen from the bottom, from the hook side.

3. The optimisation range covered the main hoisting winch, as the auxiliary hoisting winch was working faultlessly. The basis for optimisation of the system working on the common shaft was application of the so called **mechanical loadsharing**, consisting in a virtual change **of the motor characteristics, from the natural characteristics into more permissive ones, by introducing a negative compensation of slip** and switching the converters into the work mode of **the feedback open loop**. The slip compensation has been established at **-300%. Full AMA has been conducted.**

The readout of the torques was made in VLT® Dialog software, on both the converters simultaneously.

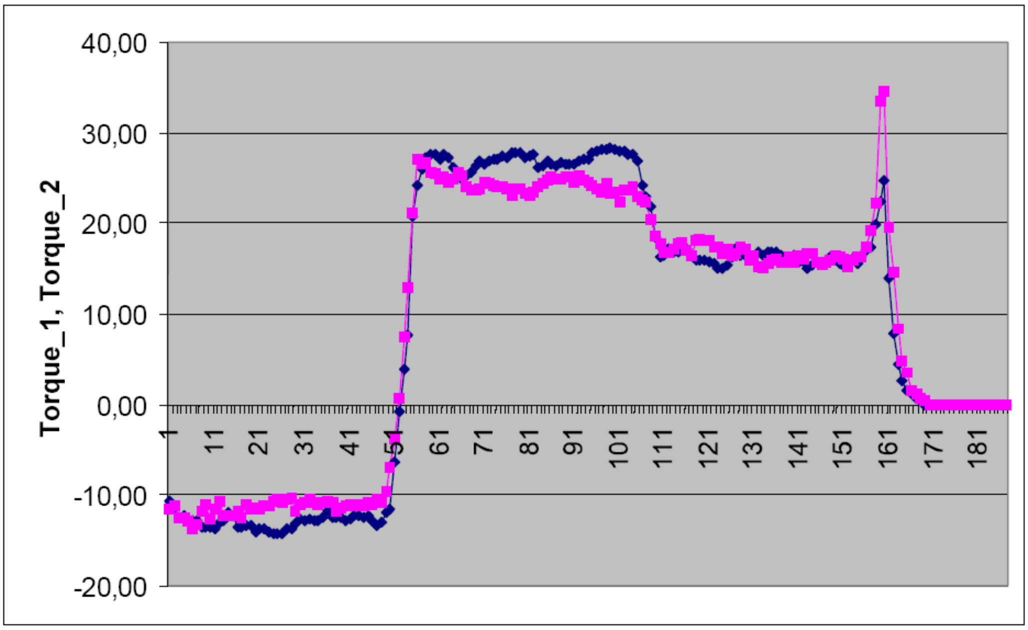

Fig. 4. The load torques' distribution of both the motors during lowering (generator work mode), reverse, and then lifting the load of **20t.** Blue line – left motor; Pink line – right motor

Fig. 5. The hoisting winch during the 20t load test.

Fig. 6. VLT® AutomationDrive FC302 built in panel

4. Final conclusions

4.1. During the test, the hoisting winch was loaded with a mass of 30t, which is its work load. No anomalies were observed in the work of the hoisting winch at this load.

4.2. When the slip compensation was set at the value of – 300%, the balanced characteristics of both the motors' torques were obtained, according to the curve from **Fig. 4**, as for the motor work mode as for the generator one. It indicates the VLT® AutomationDrive FC302 converters act properly in solutions of this type.