



Wind turbine retrofit for soft grid connection



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Many stall regulated turbines are 15-20 years old resulting in the original controller spare parts are more expensive and difficult to repair for sustaining quality. Old Thyristor Controller technology can be replaced with a modern compatible control solution for softer and improved grid connection. The entire replacement process can be carried out in just a few hours.

A case example – Retrofit M1500 / M1600 stall regulated wind turbines

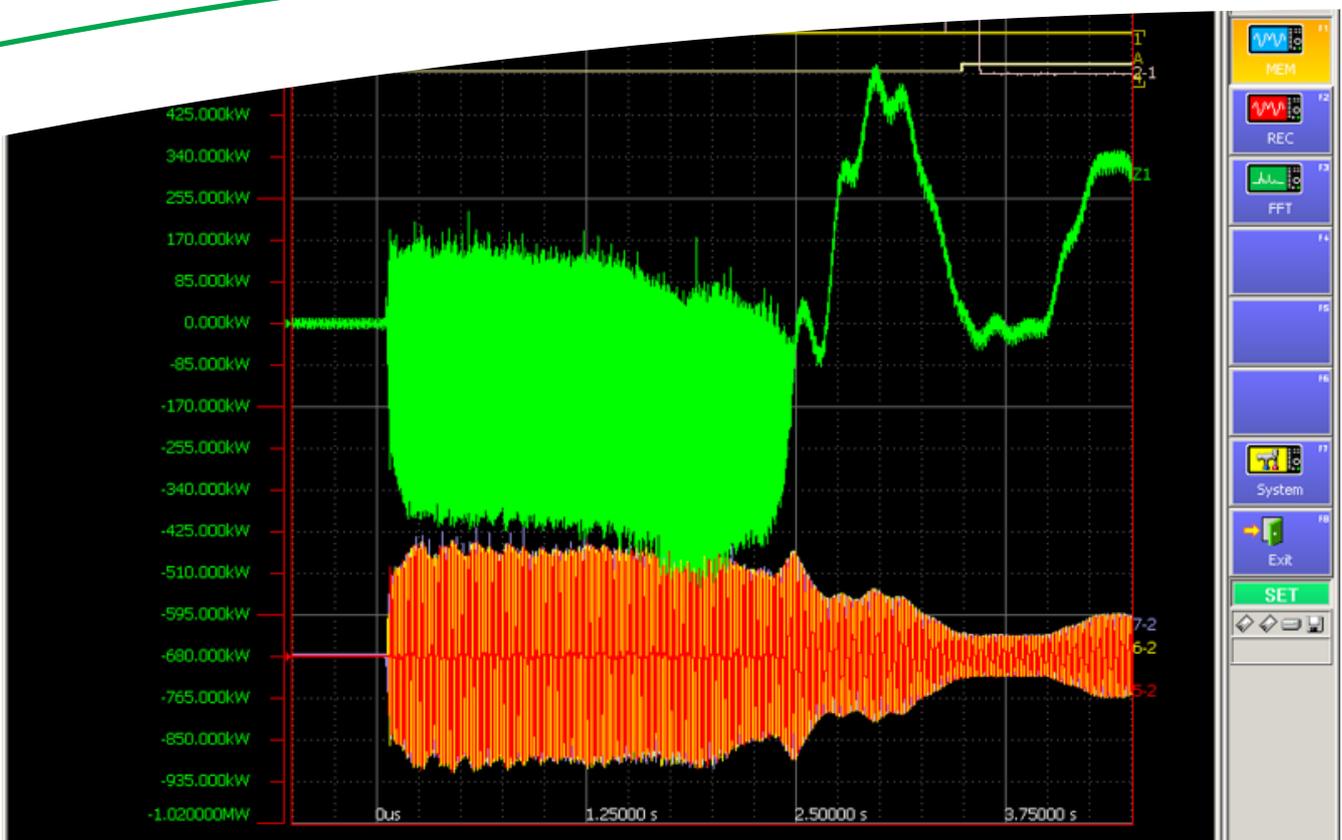
A modern solution to retrofit stall regulated turbines Thyristor controller takes point of departure in a case for retrofitting M1500 and M1600 wind turbines with older Thyristor controllers that were damaging the gearbox and drivetrain. Instead, a new solution has been installed for optimal current control with a soft grid connection.

The primary function of the Thyristor Control Module is to protect the turbine generator when connecting to the grid. During a start-up, the turbine reaches the nominal speed for starting power production. The critical point is when the generator gets synchronised with the grid enabling the turbine controller to select the correct time for closing the contactor for full connection of the generator.

The problem

In thousands of older turbines the traditional Thyristor Controller is an old and plain solution which is based on a current control solution for connecting the generator to the grid on a low speed level. This inflicts a negative effect to the gearbox and drivetrain with a large amount of stress as the generator switches from motor to generator operation at nominal speed combined with a fast change from negative to positive power generation.

A standard current controlled process does not take the generator dynamics into account. This means, when running lower than nominal speed, the peak power can get extremely high affecting harshly the gearbox and drivetrain during the switch from motor to generator operation. In addition, changing into a generator operation (in just a few seconds) the generator changes to producing power into the grid.



Negative current effect

A standard synchronisation with current controlled synchronisation and significantly power consumption below rated speed. Please note the duration of the motoring current and the negative peak just before entering active power generation.

The solution

How to connect a generator to the grid without stressing the gearbox and drivetrain?

The philosophy is to use the actual acceleration to select the optimal speed level for soft connection to the grid. DEIF Wind Power technology uses the Thyristor Control "cut-in" Module (TCM-2) to replace the older controller. TCM-2 builds on a speed based control algorithm that adapts to the actual speed and acceleration on the rotor and generator. The result is a much more efficient current in-rush of the generator and benefits by reducing stress on especially the gearbox.

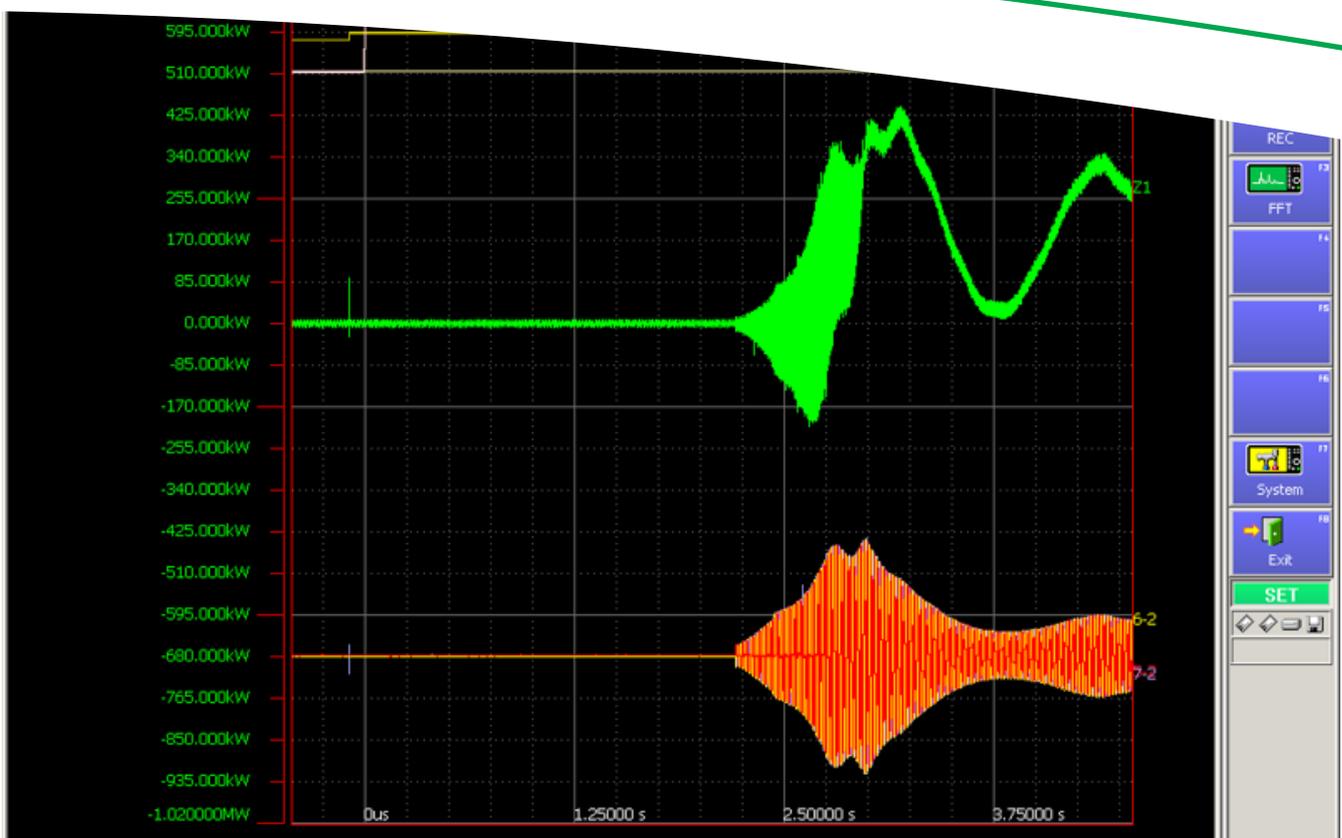
Solution package

- ▶ Thyristor Controller (TCM-2)
- ▶ Installation instruction
- ▶ Connection drawing
- ▶ Support

Since 2007, DEIF's TCM-2 has been installed in many older turbines instead of the original Thyristor Control Module. For instance, a turbine owner of older M1500 stall regulated turbines has recognized the improvements with the grid connection of his turbines after retrofitting with DEIF's Thyristor Controller. Before, he had to replace his turbines' gearboxes twice within 5 years because of damages caused by the turbines' controller at the time, which is expensive in the long run. Instead, DEIF assisted with the installation and parametrization of a completely compatible and modern Thyristor Controller for the M1500 wind turbines. The benefits are; reduced maintenance cost and improved performance in terms of extended lifetime.

The benefits of a modern Thyristor Controller

- ▶ Save time and money on old spare parts
- ▶ Thyristor Control module includes 5 years warranty
- ▶ New control features giving less downtime
- ▶ Less stress on the drivetrain
- ▶ Very fast one-to-one replacement in just a few hours



Optimal current effect with a softer grid connection

Synchronisation with a DEIF TCM-2 with an RPM based algorithm that minimizes the motoring current below rated speed and thus minimizing the stress on the drive train from during the abrupt change from motor operation and generator operation. Please note the smooth current flow with a minimum of motoring current and negative peak before entering active power generation.



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