

# ROTOR DYNAMIC ANALYSIS GENERATOR TO SYNCHRONOUS CONDENSER CONVERSION

Bailly Power Plant - Indiana, USA

*Evaluation of the dynamic behaviour and preliminary design of a 450 MVA generator to convert it to synchronous condenser, detecting and solving any vibration problems. Rotordynamic modelling, design and mechanical engineering, conversion planning, selection of components.*

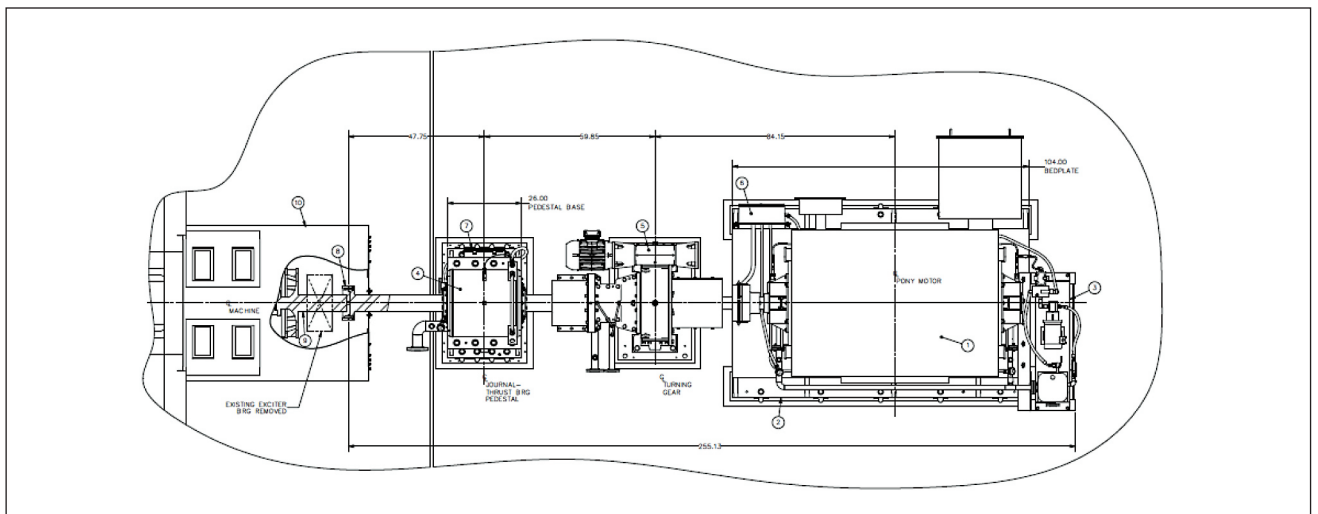


## INTRODUCTION

Due to their environmental impact many energy plants close to cities are being closed, so the electricity provision needs to be brought from larger distances, in many cases hundreds of kilometres. This long energy transfer at high voltage modifies the power factor of the line at the place of consumption, increasing significantly energy losses. A possible solution to the energy losses is placing a synchronous condenser to correct the power factor of the electrical line.

## OUR WORK

The project consisted in the modification of a **450MVA General Electric** steam turbine - generator to convert it to synchronous condenser. To do that, the generator needs to be disconnected from the turbine and provided with a starter engine to reach its nominal rotation speed. **MECANALISIS** has experience in this procedure as this is our fifth project of this kind, and after the scheduled closure of the plant in June and the following conversion work, we're hoping to successfully put in operation the unit at the end of 2018, delivering **380MVAR** of compensation to the electrical network.

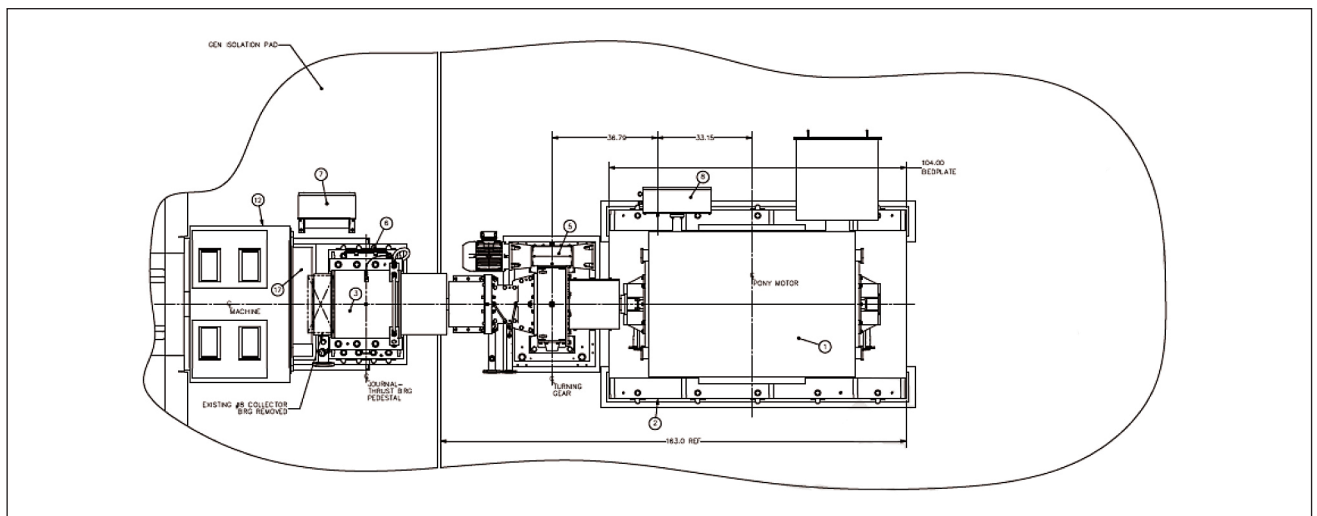


Original design of the unit.

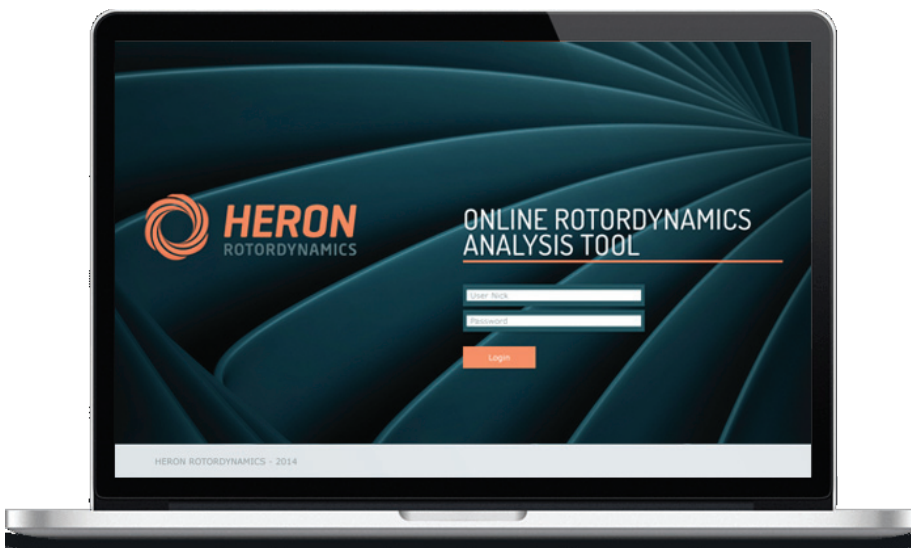
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To make the generator work as a synchronous condenser we needed to produce the mechanical design of all the components to be installed, couplers, engines, clutches and their protections, so it can be detached from the turbine and connected later to a starter engine and a slow turn device. Once this modification is performed, the generator can work independently, without the need of the turbine in operation. Then, it's synchronized to the network and kept connected so the power factor ( $\cos \Phi$ ) is corrected.



Modified design proposed by MECANALISIS.



It is worth mentioning that to complete this project, all the rotordynamic modelling was performed in our simulation software **HERON**.

**HERON** not only develops the engineering modification, but also optimizes and supports all the calculations and planning in advance to the conversion, anticipating and guaranteeing the proper operation of the unit.

