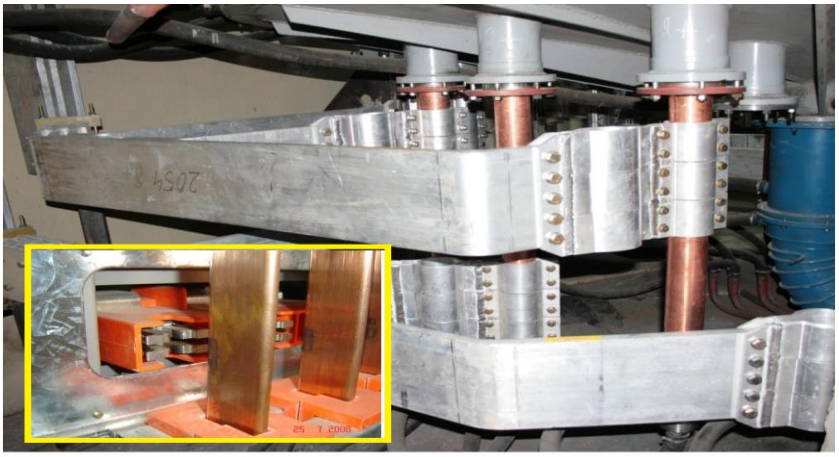
ALUMINUM INSTEAD OF COPPER:
Steps to convert panels / switchgear design

Authors name: Sergio Feitoza Costa - COGNITOR – Consultancy, Research and Training Ltd.

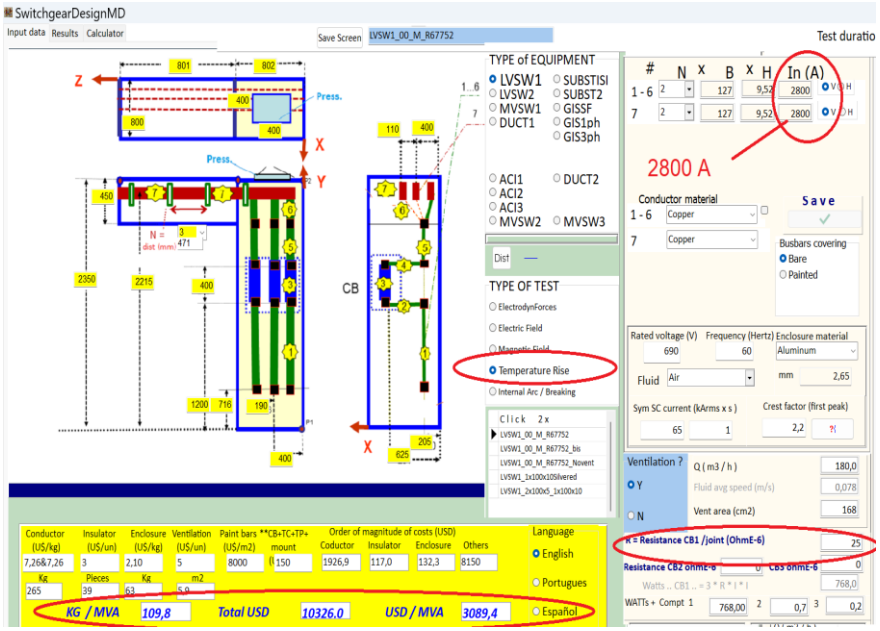
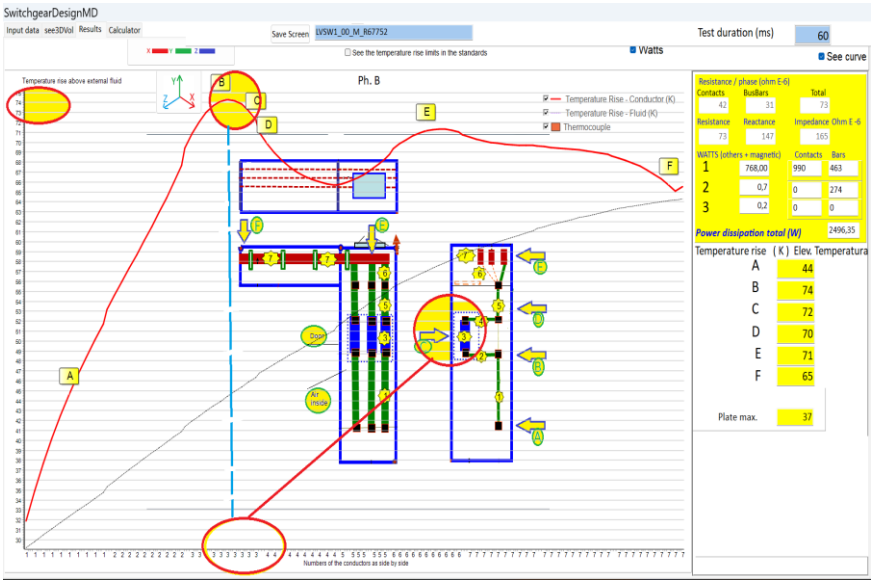
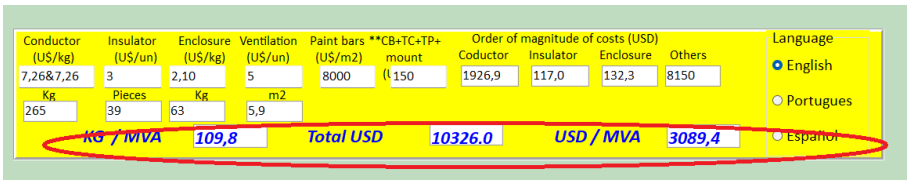


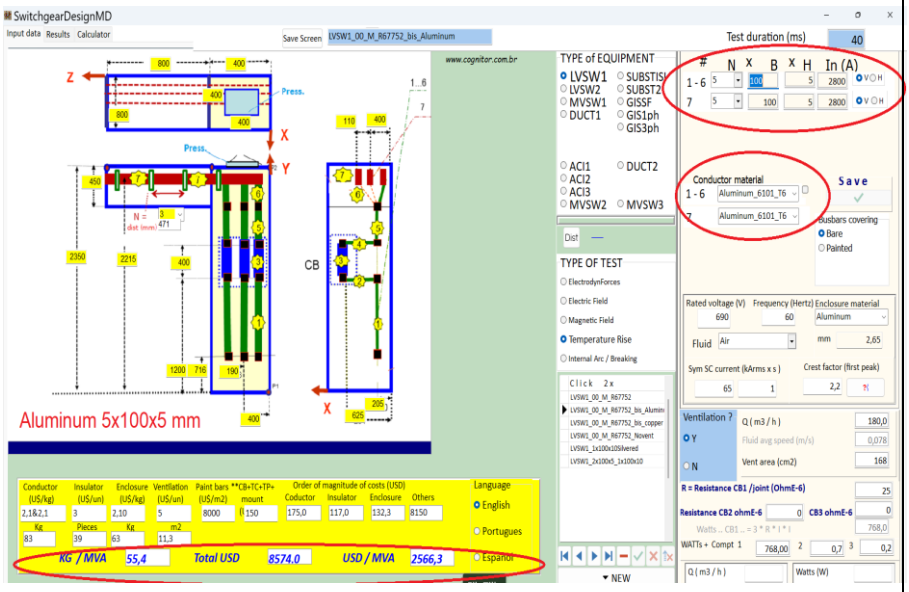
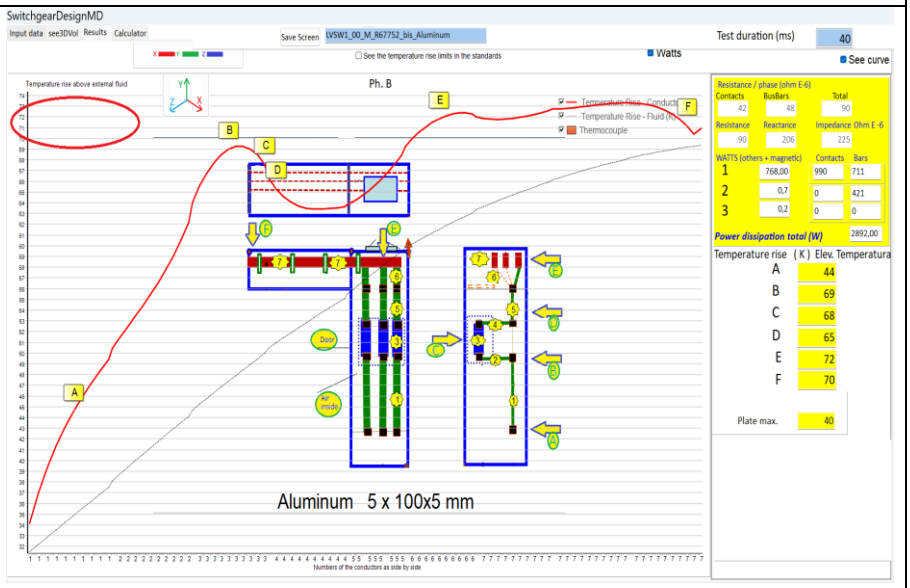
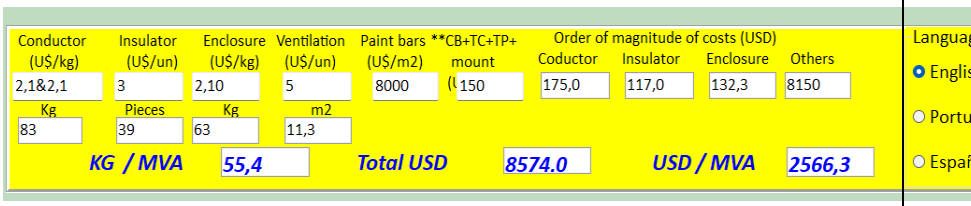
Check the high reduction in weight (50%) and the lower estimated cost (80%), for the aluminum alternative.

For more details about this matter read the article in this link, with special attention to Table 3.
https://www.cognitor.com.br/DesignOptimizationCuxAl_2019.pdf

This is a short text to explain the approach to convert an existing COPPER DESIGN to another made of ALUMINUM.
Both are 2800 A rated current (temperature rise test)
The maximum permitted temperature rise in the connections to the circuit breaker is 75K. The same is applicable to the connections between bars

Although written to help the participants of my trainings on design, testing and specification of switchgear, busbar systems and substations, using SwitchgearDesign software, these concepts are applicable in general.

Step	Action	Example of geometry
1	Take your existing **COPPER DESIGN** as defined by the materials, permanent current and geometric dimensions. Only the data in the right side is necessary. Check each value carefully because all of them are important in the results of the temperature rise test This test is the one which define the main design using copper. Other aspects of tests lie short circuit forces, internal arc and dielectric distances are easy to accommodate	
2	Do trials changing the value of the test current up to the value that produce, in the terminals of the circuit breaker, a temperature rise 75K (standard limit for a silver plated connection) In this example the value for the **COPPER DESIGN** was 2800A	
3	Verify the estimated cost of the **COPPER DESIGN** alternative (kg/MVA and USD /MVA). Use unit costs practiced in your area	

Step	Action	Example of geometry
4	**ALUMINUM DESIGN:** Use your creativity to create a design which, if you pass the same current (2800 A), it will produce the same temperature rise (75K) to pass in the test You can create as many alternatives as you wish. Select the one which more reasonable for your purposes. Compare the costs and compare it with the original design made of copper	
5	**ALUMINUM DESIGN:** Attending the same temperature rise limit of 75 K with 2800A	
6	**ALUMINUM DESIGN:** Estimated costs kg/MVA (50%) USD/MVA (80%) are considerably lower than the copper alternative	

The author of this paper is Mr. Sergio Feitoza Costa.
Sergio is an electrical engineer, M. Sc in Power Systems, and director of COGNITOR. He develops designs for switchgear and has a long experience in management, operation, and design big to small high power testing laboratories

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