

**LHC: Bus-Bar delivered on 30-08-06**

*Rev. 0 date 18.10.06 - Report about activities for reconditioning of Bus Bar sets delivered wet by water on 30-08-06 (Ref. NC-CERN 409)*

**Introduction**

Here below are reported the test and the activities necessary for the reconditioning of the bus-bar sets delivered wet by water on 30-08-06. The problem was discovered late (during the assembly operation) because at the delivery the outer bag were dry and there wasn't any evidence of the defect. In fact as arrived the bus bar were properly stored without removing them from the frame used for the transportation and inside the nylon bag as packed from Cern supplier.

**Description of the problem**

After the delivery the bus bar were stored leaving them on the frame used for the transportation and inside the nylon bag as packed from Cern supplier. The following Fig. 1 shows the bus-bar storage before the assembly.



Fig. 1: Bus-bar storage

When the first bus-bar set were taken from the rack in order to be assembled into cold mass, a lot of bars showed water inside the nylon bag, as reported in the following Fig. 2, 3 and 4.



Fig. 2: Bus-bar inside nylon bag



Fig. 3: Bus-bar inside nylon bag (detail)



Fig. 4: Water inside the nylon bag opened

#### **Test performed to dry the components**

The first test done in order to dry the bus-bar was to put them under the heat of electric light (2 lamp of 500 W) see Fig. 5. This was efficient for the bus-bar end where the glass woven protection was effectively dried but the following electrical test showed that there was a lot of water inside the glass-epoxy case.



Fig. 5: Bus-bar ends under lamps

Another test performed, following Cern suggestion, was to feed the bars with direct current (Max. 60 Amps) in order to heat them. Such test was performed leaving a bus-bar set with 60 Amps for one day; the temperature increase was not more than 3 °C and the electrical test performed every six hours never showed any improvements.

Then was decided to remove the lids of the glass epoxy case and manually dry the bar inside; the following fig.6, 7, 8, 9 and 10 shows the quantity of water found inside the case.

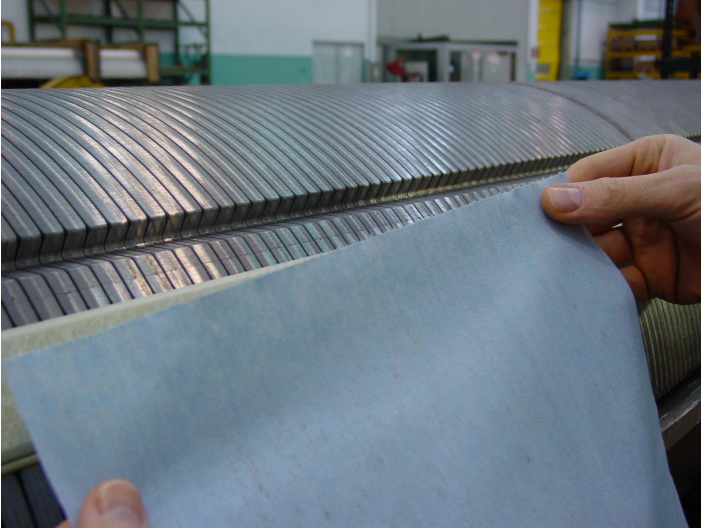


Fig. 6: Clean and dry cloth before bar drying

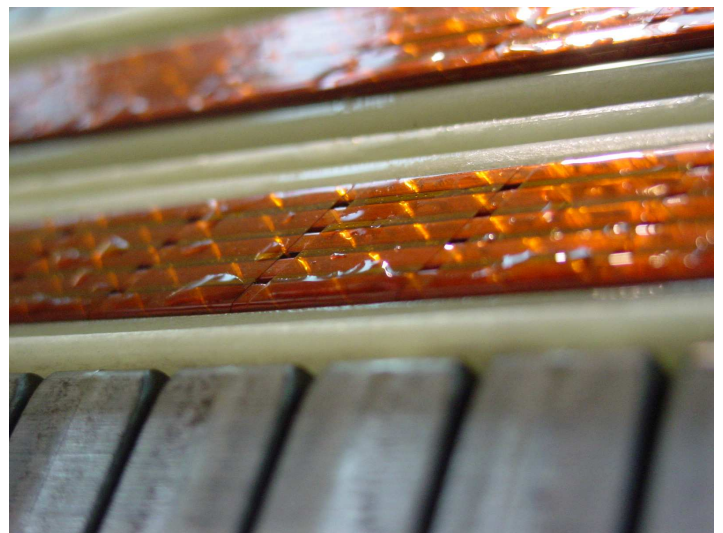


Fig. 7: Detail of the surface to be dried



Fig. 8: Wet cloth after bar drying



Fig. 9: Water found inside after lid removal

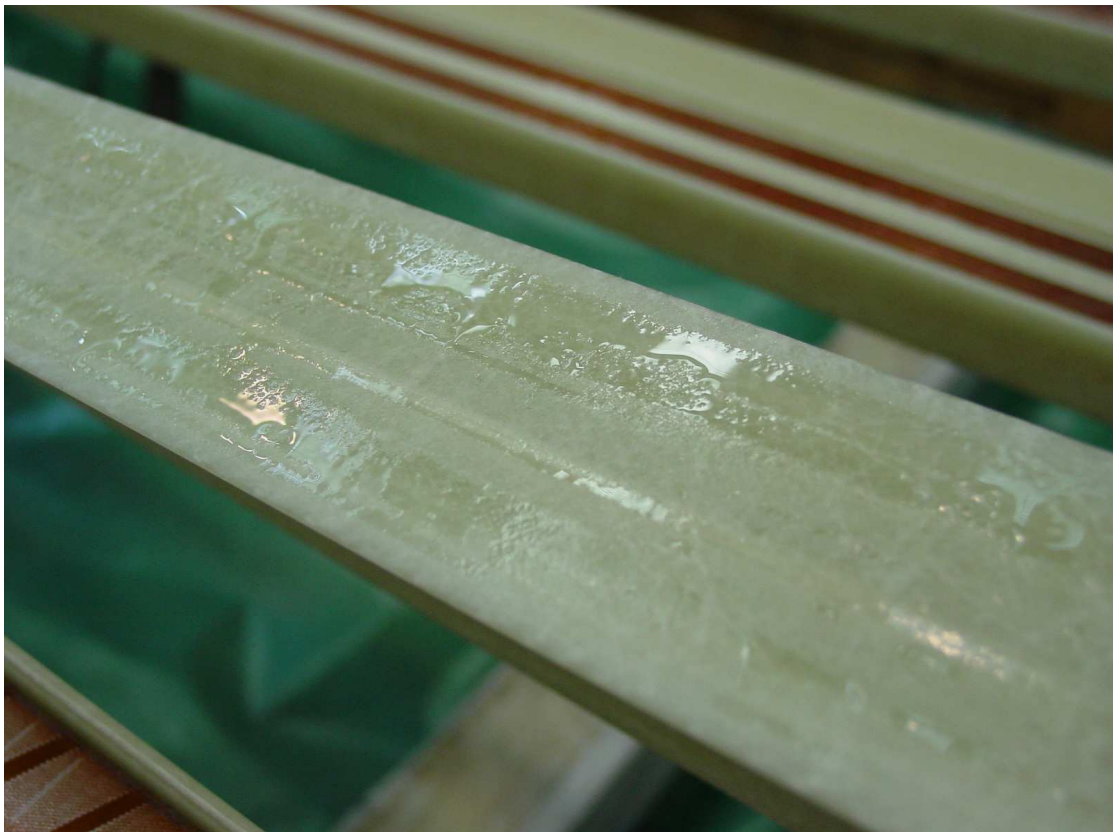


Fig. 10: Water found inside after lid removal

**Procedure adopted to dry the bus-bars**

All the test showed that the only way to dry the bus-bars is to open the glass epoxy case and manually dry the bars and the case. So the rack was put on support (in order to allow a better air circulation) and all the bus bars nylon bags and caps were removed as show in the following Fig. 11 and 12; then in small groups the bars were moved to other station for the opening of the case and the drying (see Fig. 13).



Fig. 11: Bus-bars rack on supports



Fig. 12: Bus-bars without nylon bags on the rack



Fig. 13: Bus-bars opening and drying

### List of bus-bars involved

Type B			Type A			Type A		
M1	M2	M3	M1	M2	M3	M1	M2	M3
617	617	617	610	610	610	621	-----	-----
618	-----	618	611	611	611	622	622	-----
619	619	619	612	612	612	623	623	-----
620	620	620	613	613	613	624	624	-----
624	624	624	614	614	614	625	625	-----
625	625	625	615	615	615	626	626	-----
623	623	623	616	616	616	-----	627	-----
-----	626	626	617	617	617	628	628	-----
622	-----	-----	618	618	618	629	629	-----
			619	619	619	-----	-----	630
			621	-----	-----	-----	-----	631
			622	622	-----	-----	-----	632
			623	623	-----	-----	-----	634
			624	624	-----	-----	-----	635
			625	625	-----	-----	-----	636
			626	626	-----	-----	-----	637
			-----	627	-----	-----	-----	638

### Conclusion

The activities to handle, dry, test and store the bus-bar required a lot of extra hours because of the difficulty to move such components (consider that any movement requires the use of the crane and the lifting tool) and because of the electrical test necessary (all the bus-bars were tested several times checking the insulation between bar to bar, bar to auxiliary bus bar, aux to aux, and bars to ground).

The whole amount of extra hours consist of: 40 hours technical staff and 345 hours man power including production losses for 2.5 days.