

## THE INTEGRATION OF SME'S INTO FUSION PROJECTS – ESPECIALLY FOR THE MANUFACTURING OF COMPONENTS FOR W7-X

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The Consortium of Babcock Noell in Würzburg (Germany) and Ansaldo Superconduttori in Genoa (Italy) is producing the 50 nonplanar superconducting coils for the W7-X project.

For the realization of the W7-X coils, especially for the manufacturing of the different components, an international network of companies is used, among them several SME's: highly specialized small and medium size enterprises. One of these SME's, which surpassed itself, is the Swedish foundry Österby Gjuteri AB which has produced the stainless steel coil casings for W7-X.

The design of the SS casings was changed by the customer after placing the contact. This has caused the question to manufacture the halfrings with cast segments or as entire castings, which lead finally to the contact with Österby. A lot of effort was necessary to design the 10 different patterns for the 5 types of casings each consisting of 2 halfrings. The qualification of the SS grade for the high requirements of the project, among them the low cobalt content or the required mechanical properties at 4K needed some time. Further on a lot of investigations about the test procedures were necessary to be applied for the special geometry of the product, for the 3D measurements or the NDT. The conventional x-ray was not completely suitable for this product due to the thickness of the material in some areas. The main production steps for each halfring will be presented in the paper. The testing includes different NDT, the material tests at RT and 4K and the 3D measurement.

The first casing was delivered end of 2001 and the last in autumn 2005 after several unexpected interruptions. All were treated in a close contact with the customer and in good collaboration between Österby and BNG and have lead to a significant increase of competence on both sides.

Several other SME's are involved in the network for W7-X realization. There are for example:

- C-CON in Rottenburg and its subcontractors PEM and KUKA in Schwarzenberg for Final Machining and 3D Measurement
- A lot of smaller but difficult tasks are carried out by some special subcontractors across Europe, like Marti Supratec AG and Alumenziken Industrie AG in Switzerland, Gatex and Lenz in Germany

The paper will show the special challenges during the manufacturing of the W7-X coils.