THEVA FABRICATES 37 METER LONG COATED CONDUCTOR

THEVA SUCCEEDED IN DEPOSITION OF 37 M CC WITH 158 A AVERAGE CRITICAL CURRENT AND 10 M CARRYING 200 A END TO END

End of May 2005 THEVA has successfully deposited its first 40 m – class coated conductor (CC). The 37 m long and 10 mm wide CC is based on a non-magnetic Hastelloy C276 steel tape with an ISD-aligned MgO buffer layer and exhibits an average critical current value of 158 A. During the fabrication process the tape had to pass seven different manufacturing steps from the initial substrate polishing to the final oxygen anneal and metal layer deposition.

Earlier this year THEVA had already succeeded in fabricating a 10 m long tape with 200 A end-to-end critical current. The latest 37 m - tape is a consequent step forward and demonstrates that all processes are operating with appropriate stability and reliability. Even if there were considerable fluctuations in I_c due to distributed local defects we regard this a very successful first attempt and we are confident to achieve critical currents over long distance comparable to our results in shorter samples. In the meter range these are already 300 – 350 A/cm and on the centimeter scale close to 500 A/cm. The main performance improvement is expected to arise from a completely re-designed electro-polishing and cleaning facility, which is currently installed.

In retrospect, the year 1998 marks the beginning of the CC development at THEVA. At that time, RABiTS© - substrates served to develop the tape handling and deposition process technology. Parallel, the development of an independent alignment and deposition route – known as inclined substrate deposition (ISD) by e-gun evaporation - was pressed ahead. In 2003 when this proprietary alternative technique resulted in superior performance, the RABiTS© - route was abandoned. Since then, the development has been focused on the new technique and the processed tape length, HTS film thickness, and critical currents have continuously increased.

40 M - CLASS TAPE MARKS TURNING POINT TO COMMERCIAL PRODUCTION

The 40 m - class tape marks the turning point from basic process development to commercial production. This length is already on a useful scale for first applications and we expect that there is sufficient request for our current annual production capacity of 4 - 5 km.

Our mid - term strategy is to roughly triple the processed tape length every year. Consequently, the near – term perspective for 2005 is to establish 40 m as kind of a standard tape length in our prototype manufacturing line. By the end of the year we want to reach end-to-end transport currents of 250 A/cm. The tape throughput is scheduled to increase from currently 2 samples per month to 2 - 3 long tapes per week. In 2006 we will certainly see the first commercially produced CC tape exceeding 100 m.

PROTOTYPE PRODUCTION STARTING IN JULY

The equipment for this prototype production is now in place and will be taken into operation one of these days. The capital investment for the realization of the current capacity has been very moderate and THEVA has been investing very efficiently in its new technology. In the seven years since begin of the development in 1998 THEVA has spent a total of about 3 M€ (3.6 M$) – all Government funding, labor and equipment costs included. Compared to others this is a very small amount and consequently our break-even point is reasonably low. This means that we can sustain our operation even if the market will be limited at the beginning.

When talking about costs many people tend to forget that these initial investments or at least the interest have to be broken down on the product

price. Efficiency and cost control give us a competitive edge even if we have to face competitors with a much stronger financial background.

Another approach to reduce the CC cost per kAm is to aim at high critical currents. One benefit of the ISD - technology is that we have not encountered significant j_c - degradation with increasing film thickness. This holds at least up to 3 μm and the currently applied standard thickness of 2 μm does not constitute a physical limit. Since the HTS coating is only one cost factor among many others, going for thicker films is a very effective means in reducing the performance costs and we will certainly exploit this potential in the future.

VACUUM DEPOSITION LONG-TERM COMPETITIVE WITH OTHER TECHNIQUES

In the long run and if the market calls for it, a major investment in equipment will be necessary to establish production capacities beyond some 10 km per year. The proper time for this investment will probably come around 2007/08 when the risk is better calculable. Our internal cost assessment indicates that in all stages on the way to a large volume market our vacuum deposition technique can compete with the widely favored MOD route and ultimately cost can drop below the 20 €/kAm threshold.

About THEVA Dünnschichttechnik GmbH

THEVA is the world's leading manufacturer of HTS coatings. Founded in 1996 as a spin off of the Technical University of Munich, the company is privately owned and located on the outskirts of Munich, Germany. Since 1998 THEVA has been developing a proprietary CC process technology, which is currently transferred and utilized for prototype CC production.

THEVA DÜNNSCHICHTTECHNIK GMBH
ROTE-KREUZ-STR. 8
D-85737 ISMANING, GERMANY
PHONE +49 89 92 33 46 - 0
FAX +49 89 92 33 46 - 10
INFO@THEVA.COM
WWW.THEVA.COM