

February, 2013

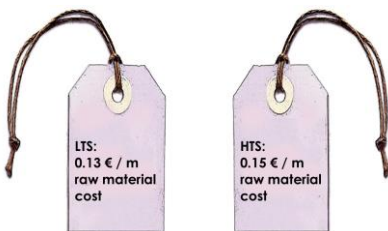
„High Temperature Superconductors (HTS) obviously profit from two properties:

They show almost no electrical losses and allow incredibly high current densities.

This points directly to efficiency and more compact designs.”

Facts:

- Superconductors can be distinguished into LTS and HTS
- LTS conductors offer already now a better price/performance ratio than copper
- HTS has a similar price base and can do the same—provided a similar volume is reached
- Lower cooling requirements conserve the price benefit.



Raw Material Cost of Low Temperature Superconductors and High Temperature Superconductors are Very Similar.

Can Superconductors Beat Conventional Copper on Price?

Commercial use of superconductors is already well established – medical and analytical applications (NMR) as well as crystal growth magnets in the semiconductor industry use by default low temperature superconducting (LTS) magnets.

Superconductors need cryogenic cooling for operation. For LTS this means an operating temperature of 4.2 K (-269 °C). For high temperature superconductor (HTS) magnets the operating temperature is closer to 30 K (-243 °C). What sounds like a little difference is a major step in simplicity of cryogenics and of cooling efficiency – conserving the economic edge.

The interesting fact is that superconductors already beat copper in price. The most common LTS wire is made of the alloy NbTi. In 2010 it was produced in quantities > 50,000 km at a pricing level of about 0.60 €/kAm at operating conditions. This is about 4x raw material cost. The more modern HTS have very similar raw material cost. Historically, NbTi has experienced a considerable cost down over time with increasing production levels. Applying the same to HTS results in a price of about 1.00 €/kAm. This would be tenfold lower than today's Copper cost, which is above 10 €/kAm.

In a nutshell: Superconductors can be better in price than copper when based on the same performance. Don't forget about the cooling, though.

What is a Path into my Products?

The art of using this technological opportunity lies in the right combination of mature and well-known technologies with innovations.

Analyze the product portfolio: When and under what conditions is HTS a reasonable choice? What is the engineering path towards your new product? The ECO 5 Team can support from strategic planning to product development and provide expertise otherwise difficult to obtain.

Strategically align the supply chain: During development and prototyping the supply chain needs to be aligned to account for suppliers of the new components. The ECO 5 Team has long-term experience and a neutral market perspective. We can support in the integration of the new components from an engineering point of view as well as catalyzing strategic alliances with the best fitting HTS supplier.

Know-how can have a disruptive impact on the business. Better cost effectiveness combined with the two major advantages of superconductors – compactness and efficiency – allow growth of business and establishing new markets.



„To develop HTS systems successfully, it takes deep know-how in superconductivity and refrigeration. As ECO 5 Team we got both, plus the entrepreneurial spirits.”

ECO 5 Team: Engineering Services for Highly Efficient Power Systems

- Rotating Machines
- Coils and Magnets
- Inductive Heating Systems
- Cryo Technology
- Materials Science
- Grid Expansion and Protection.

Why ECO 5?

The ECO 5 Team has a strong strategic and operational heritage; our consultants and engineers have worked for operating companies and understand the priorities that clients have in the development and delivery of projects.

Within one compact organization, we have an unrivalled range and depth of knowledge and expertise of all aspects that are vital in delivering a sound project.

For further information please contact:

Dr. Jürgen Kellers

ECO 5 GmbH

Bornheimerstraße 33b, Innenhof

53111 Bonn, Germany

Tel: +49 228 62961770

Fax: +49 228 62961774

E-Mail: juergen.kellers@eco-5.de

<http://www.eco-5.de>

As an engineering provider, the ECO 5 Team is specialized in the development of high-efficiency power systems. Our focus is on renewable energy generators for wind, hydro, and wave power. Beyond these fields, core competencies lie also in fault protection of high-voltage grids and inductive metal heating. In these areas we contribute highly specialized know-how in the application of industrial-grade superconductors as well as in more conventional copper and permanent magnet solutions. Strategic and marketing competencies complement the technical expertise.

We manage customer projects from strategic line up, feasibility analysis up to prototyping. In technical expertise and tools we cover materials science aspects, multiphysics FEA, and 3D CAD. Supporting these activities, we offer our competence in the areas of cryo technology, plant and process safety, and the analysis of IP rights pertaining to a technological development.

Disclaimer and Copyright

While we make every effort to keep the information on our Fact Sheets current, we accept no liability whatsoever for the content provided. The content and works provided herein are governed by the copyright laws of Germany. Duplication, processing, distribution, or any form of commercialization of such material beyond the scope of the copyright law shall require the prior written consent of its respective author or creator.