Capital Goods: Appendix B- Case Studies of innovative projects

1. **CRGO steel developments in Japan, US & East Europe**

Cold Rolled Grain Oriented Steel (CRGO) was pioneered by ARMCO, USA and Allegheny Ludlum Corporation (ALC) during the period 1940-50. Since then, CRGO steel containing about 3% Silicon replaced the HR silicon Steel containing 4 to 4.5% Silicon which was used as Transformer core-material till 1940s. Subsequently, both ARMCO and ALC transferred CRGO Process technology to several other manufacturers, who produced conventional CRGO steel under license from either of the two companies mentioned above.

In Japan, CRGO steel was first developed by Kawasaki Steel in 1961. Their process involved MnS as grain growth inhibitor, while Americans employed MnS as grain growth inhibitor. Kawasaki process, which was independently developed, employed a considerably different production process to produce CRGO. Meanwhile, Nippon Steel was also manufacturing conventional CRGO steel through an ARMCO License. Though conventional CRGO steel has low core Loss; its induction (at 1000A/M or 10 Oe is around 1.80T), is not adequate to reduce the exciting current to make the transformer core more compact. Moreover, if the core loss is further reduced, the amount of energy, which is lost, as heat is reduced and further saving in power consumption is possible. This was the guiding principle in development of high permeability CRGO STEEL. Nippon Steel development the world's first high permeability CRGO steel in 1968 called Hi-B and in 1973 Kawasaki developed its own high permeability grade called 'RGH'.

Only Japanese companies mentioned above independently developed Hi-permeability CRGO and issued licenses to make this product to other manufacturers. For example, ARMCO manufactures TCH (Tran-Core H) under license from Nippon Steel – a Classic case in reverse technology transfer. Due to substantially high costs involved in such technology transfers, companies such as ALC in USA developed thin gauge CRGO to further reduce Core Losses.

East European Countries- Czech Republic and Slovakia developed a new concept in production of regular Grain Oriented Silicon Steel by using Nitrides as grain growth inhibitor rather than sulphides which is the normal grain growth inhibitor in the pioneering CRGO technology developed by ARMCO and ALC of USA. The concept of using Nitride as grain growth inhibitor resulted in a major advantage to steel makers, since Nitrides require > 14000C as compared to Sulphides which require > 14000C slab reheating temperature so that MnS goes into solution prior to slab rolling. This new type of approach was developed in 1986 by researchers at Iron & Steel Institute in Dobra, Czech Republic in co-operation with East Slovakian steel works at VSZ Kosice.

2. **R&D Initiatives of Korea Electro Technology Research Institute(KERI)**

Since its establishment in 1976, Korea Electro technology Research Institute (KERI) has been carrying out R&Ds on electro technology, testing and certification business on power apparatus as a government-sponsored institute as well as internationally accredited testing and certification body. For the last 30 years, KERI has also achieved a variety of technological achievements for power systems, power industries, electric materials and electronics for medical instruments including IT convergence technologies as well. Moreover, KERI has made itself a top-notched testing and certification organization for covering diverse electric apparatuses manufactured at home and abroad.

KERI is now playing the leadership role for the enhancement of electric industry and its business in this globe through R&Ds and testing & certification with excellent researchers, engineer's technicians including a 30-year long accumulated expertise and brand new dedicated facilities.

In the first half of 2011, KERI acquired a regular membership from the **Short-circuit Testing Liaison (STL)**, which is called as the G10 in the world's electric equipment industry. Korea became the 10th country to win the STL regular membership in the world. Britain was next followed by Italy, Netherlands, France, Germany, Scandinavia, the U.S., Japan and India. China is still a preliminary member. Meanwhile, Russia, Rumania, South Africa, Poland, Hungary and Czechoslovakia are participating members. After winning STL membership, Korea has secured a firm foothold for the domestic heavy electric equipment industry to enhance its export competitiveness. The nation is also expected to increase its foreign currency revenue through attraction of overseas test certification services.

"Along with this, KERI plans to expand the 4000MVA test facilities at a cost of KRW 160 billion for globalization of facilities, technology and services. Through globalization of the KERI brand, we can catch up with Italy in 2015 and the Netherlands in 2020 in terms of globally-recognized test and certification," he said.

In the light of convergence trend in the science technology field, including electro technology, Korea Electro Technology Research Institute (KERI) has off late targeted its efforts towards new types of technologies and services will appear in the sector. In keeping with the expanded supply of smart grids and new, renewable energy, efficiency of power systems, confidence and stable power supply will become more important tasks. In accordance with this, KERI will make a strong push for HVDC technology development to enhance efficiency and confidence in the power system. Further, KERI has also placed emphasis on R&D projects in the power propulsion sectors, including electric cars and ships.

KERI already started the technology development project related to electric cars in 1988 and now has secured the three core technologies - secondary cell, rapid charging/ discharging system, and control system technology. At the same time, it is also developing power storage technology considering the characteristic of electric energy, which accompanies demand and supply simultaneously.

KERI has decided to concentrate its R&D efforts on the development of the following six technologies - next-generation power grids, electricity propulsion technology, HVDC technology, electric equipment test certification technology, convergence medical instrument technology and Nano-based electric technology.