Technology Transfer-Experience at Scanditronix

Bengt Anderberg
Division Manager
Scanditronix AB, Husbyborg, S-75229 Uppsala, Sweden

Abstract

Scanditronix has developed many accelerator systems, most of them with a considerable amount of technology transfer from research institutes. The mechanisms for the transfer vary, but seem to be amply available. The potential of applications of accelerators in the market is always very promising, but the real market for accelerator technology is still, however, quite limited.

1. HISTORY

Scanditronix was started in 1965 as a private company to commercialize cyclotrons for use in the medical field. The first successful product was, however, a range of magnet spectrometers for nuclear spectroscopy. Those spectrometers were designed and constructed on a licence from and in cooperation with prof. Harald Enge at MIT. After a few years the company had gained resources to start the development of cyclotrons and later several other accelerators and associated equipment.

Developments

- Magnetic spectrometers of type ESP and Q3D
- 17, 20, 32, 40, 50 and 60 MeV cyclotrons
- VICKSI split pole cyclotron for HMI (K=120)
- Positron Emission Tomography (PET)
- 8, 10, 14 and 22 MeV microtrons
- 50 and 100 MeV racetrack microtrons
- Neutron therapy system
- 22 and 50 MeV electron and photon therapy systems
- 10 MeV, 25 kW EB system
- 800 and 1300 MeV electron synchrotrons (BESSY I and SRRC)
- 1.5 GeV electron storage ring (components for MAX II)

2. MODES OF TECHNOLOGY TRANSFER

2.1 Customer input

The development work has been made without any public financial support except for a few marginal cases. Each development has therefore been made as a project for a specific customer. This has enforced limits both in time and cost and set well defined performance goals. Such first customers are usually highly qualified in the field of application of the product and thereby provide for a very important part of technology transfer. In some cases the customers have also contributed with the accelerator technology itself. BESSY was such an example.

2.2. Employment of experts from accelerator laboratories

Knowhow can to some degree be obtained by employment of experts in the field. It was possible when Scanditronix started its cyclotron program, because the funding of the upgrading of the Uppsala University was delayed, and the group under dr. Svanheden moved over to Scanditronix. At other occasions scientists and engineers returning from CERN have been valuable and qualified additions to the Scanditronix staff. In some cases experts from accelerator laboratories have been engaged for a particular project.

2.3. Licence agreements

The development of microtrons at KTH (the Royal Institute of Technology in Stockholm) was originally funded by a Swedish Government Foundation. Scanditronix and KTH have a collaboration and licence agreement for the transfer of technology regarding microtrons. It has worked well for many years to the benefit of both parties. Also the collaboration with prof. Enge for spectrometers is an example of such a successful licence agreement.

2.4 Cooperation agreements

The most common and usually most fruitful way of technology transfer is by cooperation agreements. Such have been made with research institutes and/or individual members of institutes. Usually such agreements come quite natural as consequences of discussions around possible ways of development. Previous customer relations often lead to such continued collaboration. Personal contacts, geographic location and language are important factors in the choice of consultants. For Scanditronix the cooperation with the MAX-lab group in Lund has played an important role for developments of both race-track microtrons and synchrotrons.

3. TECHNOLOGY TRANSFER FOR THE SRRC SYNCHROTRON

The SRRC synchrotron built by Scanditronix is one of the latest major developments. The mechanisms for technology transfer for this project are therefore described in some detail.

A contract for the supply of the injection 50 MeV linac and the 1.3 GeV booster synchrotron for SRRC, Taiwan was given to Scanditronix in 1988.

Much of the design was based on the design and experience from the earlier delivery of an 800 MeV synchrotron to BESSY. Input to that design was obtained from the customer headed by dr. G. Mülhaupt and from dr. Mikael Eriksson at MAX-lab. We entered into a formal cooperation agreement with MAX for the project, and that cooperation has later been followed by several similar ones with the same group. Input was also given in an informal way from DESY, Daresbury and CERN for the design of magnets, vacuum, and power supplies.

For the SRRC project a new cooperative agreement was made with MAX-lab. An agreement was also made with BESSY for transfer of information about modification and improvements made to their synchrotron and about experience gained in the operation of the system.

The RF system was produced in cooperation with the customer and dr. Ernst Weihreter at BESSY using old DORIS cavities. The electron gun built for the production of both long pulses and short ones for single bunch operation was produced by Hermosa Electronics using SLAC technology.

A CERN system and procedure was used for the alignment of the synchrotron.

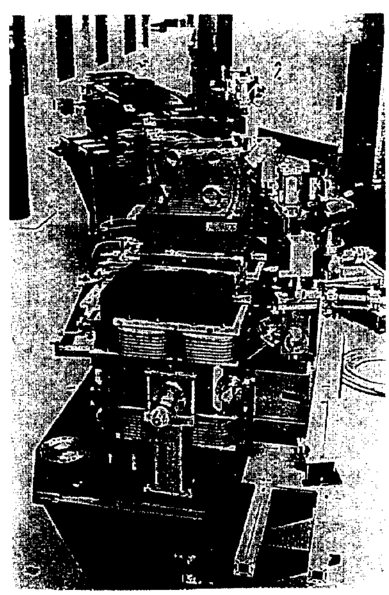
The technology obtained from the different accelerator laboratories for the project has been of high quality and has been readily available. The carrying out of a project like the SRRC injection system is therefore much reduced to a matter of project management, at least for a company with a background in accelerators. The SRRC injection system was commissioned in 1992 more than fulfilling all specifications. The measured beam current for instance was more than 20 mA to be compared to the specified 5 mA.

4. APPLICATIONS OF ACCELERATOR TECHNOLOGY

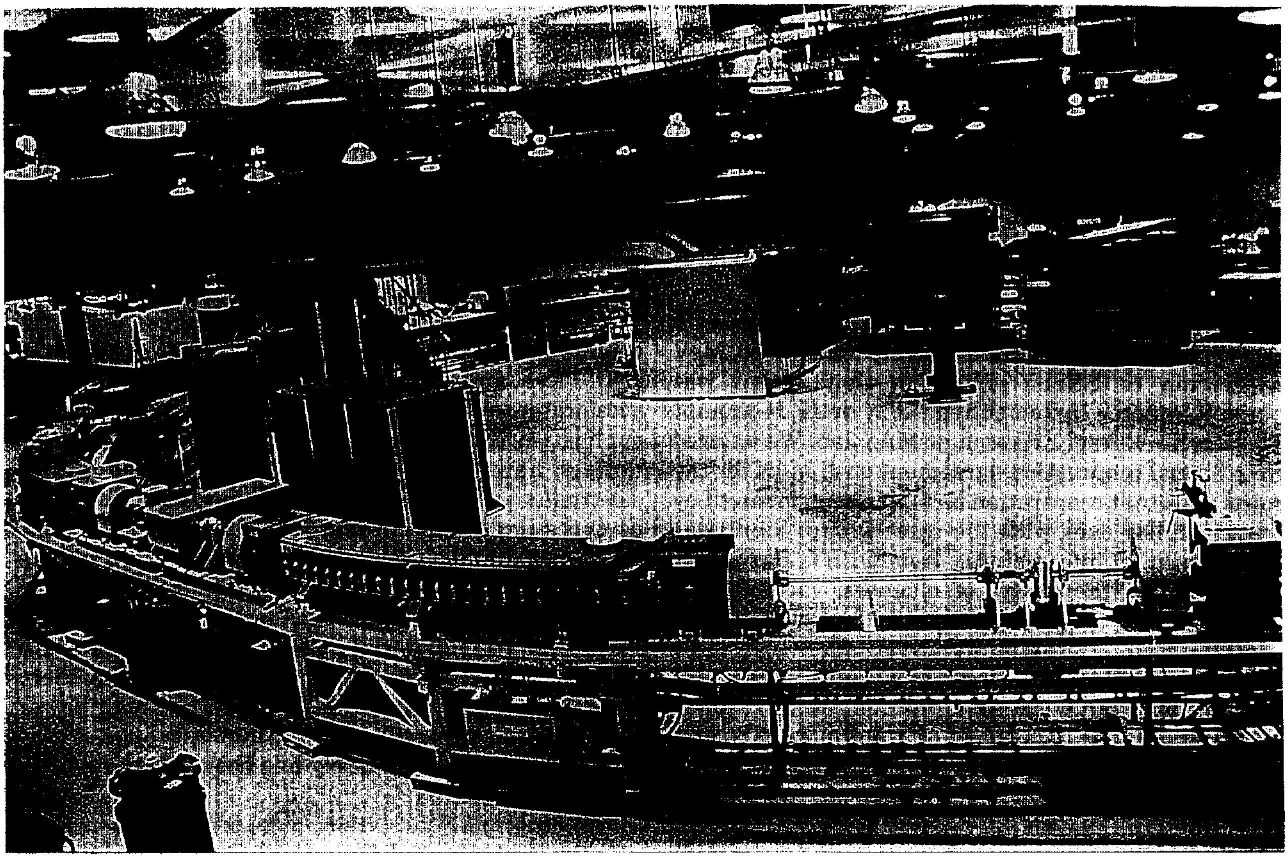
The technological status of accelerators for research has been developed to an impressing level. The urge and pressure to transfer this technology into industrial use have been rising correspondingly, and many administrative units have been created to support such transfer. The accelerator market seems however to exist mainly in the research field itself. Research laboratories buy only components at a commonly available technology level. Only few accelerators are purchased from accelerator companies.

Accelerators have found only one kind of non-research application with a substantial volume. This is in the field of radiation treatment of cancer. Here the volume is in the order of 100 electron accelerators a year. The amount of technology transferred from accelerator laboratories over the last 20 years for this application is, however, very small. Synchrotron light sources have been planned for use in the micro-electronics industry. Around 1984 they were thought to be necessary for the production of 1 Megabyte chips. Today they are thought to be needed for the 1 Gigabyte chips! Other major applications are cyclotrons for production of radioisotopes and electron accelerators for sterilization and material modification. Here the world market has been only a few units per year. Today there exist at least six companies trying to sell high power 10 MeV electron accelerators for industrial use, where the total world market lately has been less than three per year.

There is a potential for a much larger market, but the situation has lured unchanged for many years. Anyway, when the market is there, we can be sure the technology is there.



Section of MAXII 1.5 GeV storage ring



SRRC 1.3 GeV injection synchrotron