

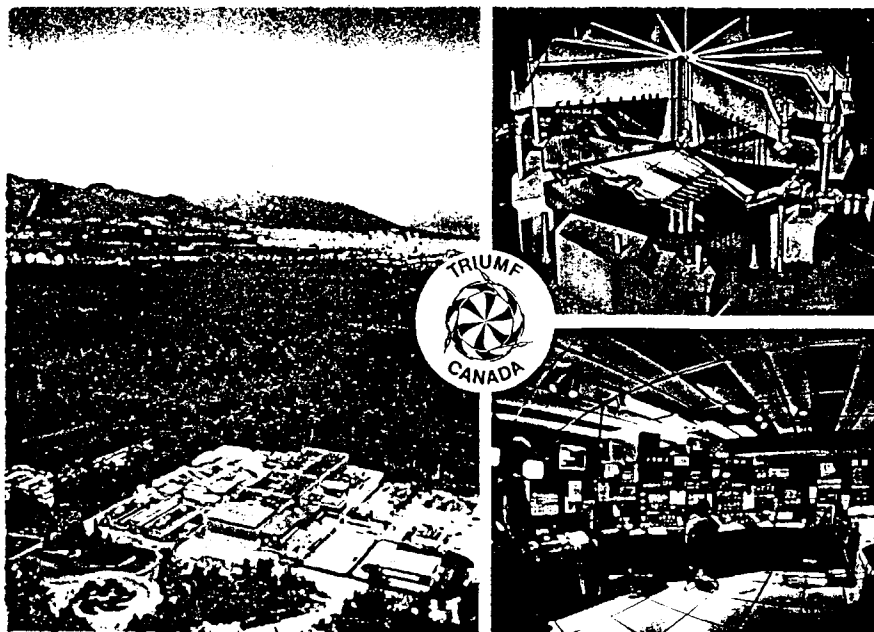
**TRAVEL REPORT**  
**Visit to TRIUMF and to Canadian Industries during week 43/95.**

**F.Voelker**

The visit to Canada took place to attend a meeting at TRIUMF concerning the CERN collaboration, in particular the magnets and power supply equipment for the PS-Booster upgrade, and to know more about the boundary conditions of deliveries from canadian industry.

**1. TRIUMF Laboratory / Vancouver**

The laboratory's mission is pure and applied research using the proton beams extracted at 60 to 520 MeV from "the world biggest cyclotron" built in 1968-74. A similarity appears between the layout of TRIUMF and that of the ex-SC plus ISOLDE complex at CERN (see Fig.). The Laboratory's future seemed somewhat uncertain a couple of years ago when the Kaon Factory project proposal was turned down (people had been busy on this project during  $\geq 10$  years). Eventually a budget plan over five years has been approved which now allows to carry on two main projects, namely the ISAC-1 (Isotope Separator & Accelerator) and the CERN collaboration. The present staff is about 300 following a recent cut of 50 people. Up to 200 visiting scientists use the research facilities. The organisation structure includes five divisions - Cyclotron , Science , Administration, Technology transfer, Accelerator technology (with  $\sim 75$  people under E.Blackmore) - but a possible restructuring is felt to be up in the air.



So far the persons involved in the power converter equipment for the PS-Booster upgrade in the frame of the CERN collaboration are K.Reiniger and F.Mammarella.

**K.Reiniger** leads the group, consisting of an engineer (R.Ginn / 58) and two technicians (B.Beck / 45 and C.Yee / 45), in charge of the ~ 300 power converters of the present facility. Additional 30 new converters are expected to be needed for ISAC-1. The present equipment is mostly based on SCR rectifiers and series transistor regulators. Simplicity and reliability have been the guidelines during the procurement of the existing power converters from a number of different suppliers. More modern techniques have been used for the prototype converters of the Kaon Factory. K.Reiniger has also responsibilities in the operation of the machine (Cyclotron Division) as well as in other external collaborations (Technology transfer Division). In view of its small size and heavy work load his group cannot be expected to have much effort available for the CERN collaboration.

**F.Mammarella** is in charge of the power distribution and energy management at TRIUMF. He collaborates with the power converter group and is going to look into the possibility of delivering to CERN the new rectifier transformers and the reactive power compensating equipment for the PS-Booster.

## **2. Canadian industries.**

### **2.1. Visited in Vancouver:**

#### **PHILTEK ELECTRONICS**

Ph. Pong (ex. member of CANADIAN DYNAMICS), president

**Staff:** 20 people (3 engineers/technicians).

**Production:** AC to DC, AC to AC and DC to AC converters; Uninterruptible Power Supplies (UPS); battery chargers; DC power supplies; custom designed power conversion equipment.

#### **ARGUS TECHNOLOGIES (sharing the building with UNITED MAGNETICS CORP.)**

C.D.Davidson, director of R&D

**Staff:** 130 people (17 engineers/technicians)

**Production:** Power systems for telecommunications; AC to DC switched mode rectifiers; DC to DC converters; mobile DC power systems; UPS systems; customer driven supervisory and control panels.

#### **ALPHA TECHNOLOGIES (belongs to the same group as ARGUS)**

B.Russel, national sales manager

O.Shandersky, marketing communications manager

S.Walker, western regional sales manager

**Staff:** 120 people (28 engineers/technicians).

**Large scale production:** Power supply systems for telecommunications; UPS systems; DC power supplies; DC to AC converters; battery chargers.

2.2 Visited in Toronto:

**STATICON**

A.M.Hase, president

R.Hase, marketing and projects manager

**Staff:** 50 people (11 engineers/technicians).

**Production:** DC power systems for telecommunications; DC to AC converters; UPS systems; high current rectifiers for electro-plating. Magnetic components and sheet metal cubicles for their products. Switched mode DC to AC converters are being developed.

**SAFT-NIFE** (part of ALCATEL-ALSTHOM / F)

P.Terrien, president

W.J.Olthoff, product manager battery chargers and UPS systems

G.J.Pollock, product line manager telecommunications systems

**Staff:** 144 people (17 engineers/technicians).

**Production:** Battery chargers and rectifiers; Ni-Cd batteries; UPS systems; power systems for telecommunications; supervisory and alarm systems.

(Some of the designs and developments are done in the European subsidiaries of this company).

**IE POWER INC** (ex Power Supply Division of C.T.S.)

B.Holmes, president

J.Muzaffar, development engineer

A.Tremills

**Staff:** 7 people (2 engineers/technicians)

**Production:** Large UPS systems; battery chargers; DC power supplies; DC to AC converters.

**VR ELECTRONICS CO.** (ex Division of INTERNATIONAL RECTIFIERS)

V.Rinaldi, president

**Staff:** 7 people (1 engineer)

**Production:** Al heat-sinks; discrete power component manufacturing and assembly;  $\mu$ P-based units to control electrical power in industrial processing.

**HAEFELY-TRENCH** (High Voltage Technology certified to ISO 9001/94 by QMI)

R.F.Dudley, chief engineer

A.A.Kaminsky, general sales manager

M.R.Sharp, engineering manager

**Staff:** 300 people (40 engineers/technicians)

**Production:** World largest manufacturer of air core dry type reactors (80 % of market share). Iron shielded reactors. Instruments V/I transformer. Adaptive VAR compensators.

**HAMMOND MANUFACTURING**

K.L.Beard, marketing manager

D.Patel, engineering manager

**Staff:** 1500 people in 15 companies

**Production:** World leader in manufacturing dry type power transformers up to 25 MVA. Toroidal and Ferrite transformers to MIL specifications. Rectifier transformers.

## **INVERPOWER CONTROLS**

Dr. S.B.Dewan, president

A.S.Popp, marketing manager

Staff: 130 people (45 engineers/technicians)

**Production:** Particle beams power supplies; medium voltage high power inverter systems; specialty power supplies; medium and high frequency power supplies; frequency converters; industrial DC power supplies; variable frequency AC motor drives; power electronic laboratory systems.

### **3. Conclusions following the visits of canadian industries**

Many of the smaller companies visited offer interesting potential to assemble entire power converters as well as printed circuit boards, electronics crates or other parts of power converter equipment according to detailed customer specifications.

**TRENCH** and **HAMMOND** are among the world leaders in their specialty and are able to manufacture and deliver high quality components as required for the upgrade of the PS-Booster main power supply.

**INVERPOWER** appears to be worldwide one of the most successful manufacturers of power converters for particle accelerators. Their list of references in this field of activity is impressive. Thanks to the strength and competence of their engineering department they have the capability to develop and build the most advanced power converter equipment.

The next step will be to examine the modalities and implications of placing orders with canadian industries in the frame of the collaboration with TRIUMF.

### **4. Result of discussions about the PS-Booster transfer line magnets**

P.Bossard has discussed the magnet design with G.Clark, A.Otter and P.Reeve. They accepted our recommendations concerning number of turns and operating current. A list of proposed magnet parameters should be communicated to CERN in November for comments and approval. The power supply specifications are assumed to be based on this commonly agreed magnet parameter list. The nominal operating current of the magnets at 1.4 GeV will be set at 80 % of maximum continuous power supply ratings.

**Distribution:**, D.Dekkers, J.Gruber, , K. Schindl, D.J.Simon, H.Ullrich  
P.Bossard / AT, J.Pedersen / ST  
F.Mammarella and K.Reiniger / TRIUMF  
PS/PO staff concerned

P.S. Some documentation about TRIUMF as well as about the companies visited is available for consultation in my office (Bd.19-2-007).