



## **Cyclotron & Medical Isotopes**

Best Theratronics announces plans to address the medical isotope shortage by manufacturing a range of cyclotrons

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General Manager  
Best Cyclotron Systems



# HISTORY

Best Theratronics started more than 50 years ago as a division of Atomic Energy of Canada Limited with expertise in the designing and manufacturing of various radiation therapy systems, irradiation systems and linear accelerators.

In March 2008, it was acquired by Best Medical International, becoming part of the **TeamBest** group of companies.

Best Theratronics is one of the largest manufacturers of radiation therapy systems with more than 2,000 units installed around the world.



# BEST THERATRONICS FACILITY

- 150,000 sq.ft. of manufacturing plant and offices located in Ottawa, Ontario, Canada
- CNSC (Canadian Nuclear Safety Commission) registered facility for operating with radioactive materials



# STATE OF THE ART MANUFACTURING

**Machining**



**Assembly Hall**



**Special Treatment**



**Storage Facilities**



**Assembly**



**Electronic Assembly**



## ENGINEERING EXPERTISE & TECHNICAL SKILLS

- **Mechanical, engineering design and assembly**
- **Electrical, engineering design and assembly**
- **Radiation physics and dosimetry**
- **Control Systems, HMI interface, PLC programming**
- **Vacuum technology**
- **Radiofrequency, engineering design, assembly & testing**
- **Facility services, engineering and technical**
- **Personnel training and documentation**



# PRODUCT LINE

## Present product line

- **External beam radiation therapy units**
- **Blood irradiators**



## Previously manufactured products

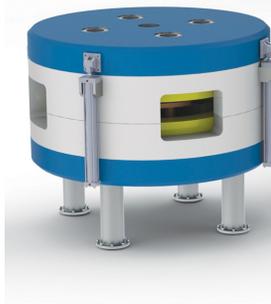
- **Electron beam accelerators for medical & sterilization**



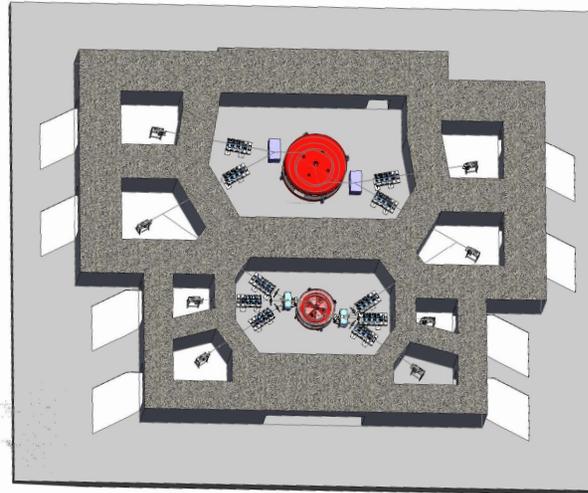
# NEW PRODUCTS & SERVICES



**Medical Cyclotrons**  
BEST 14, BEST 25,  
BEST 35, BEST 70



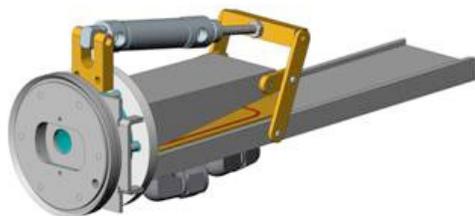
**Radioisotope Production Facility Design**  
BEST 35 & BEST 70



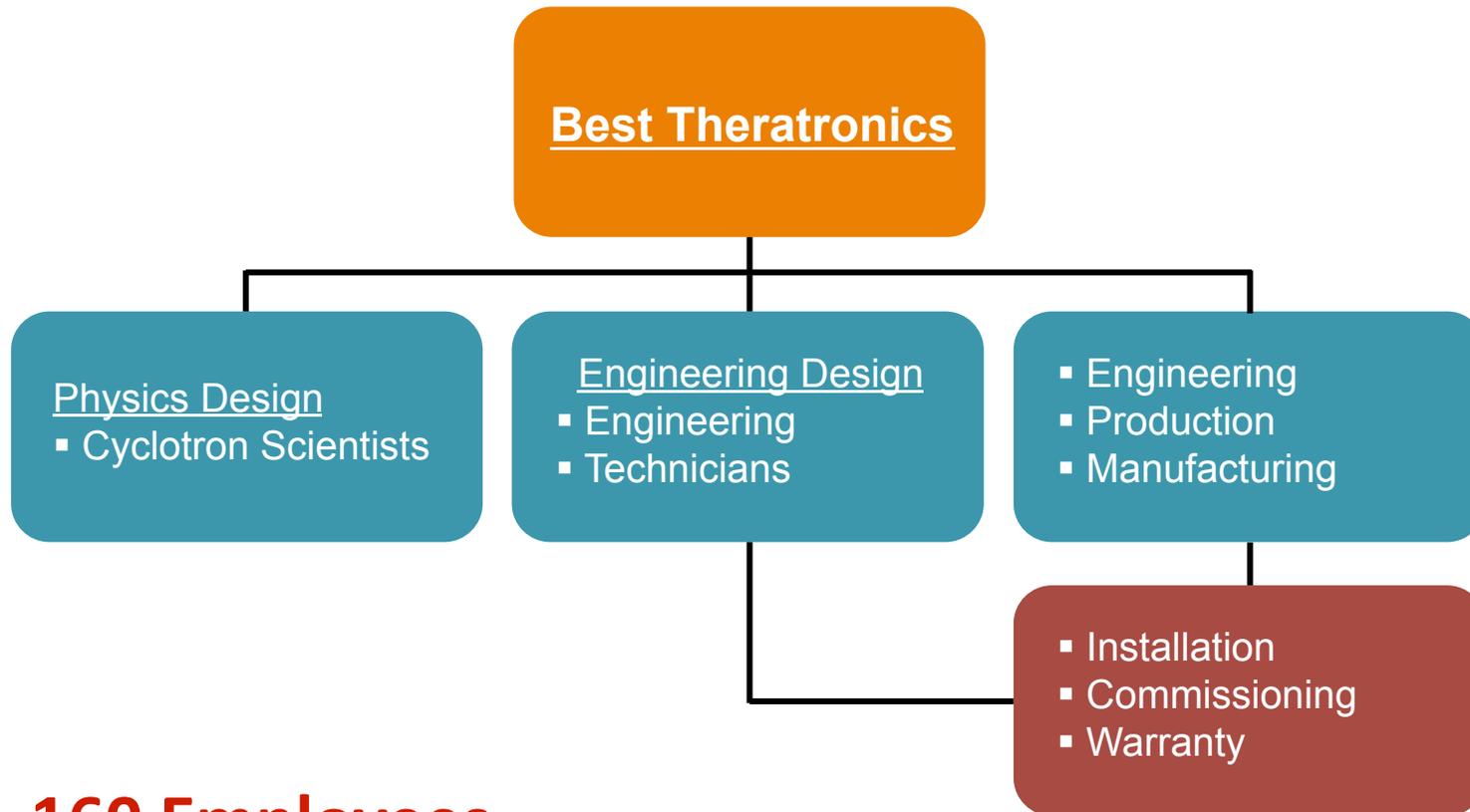
**Custom  
designed  
beam lines**

**Radioisotope Production Facility Design**  
BEST 14 (turnkey system)

**Target Systems**



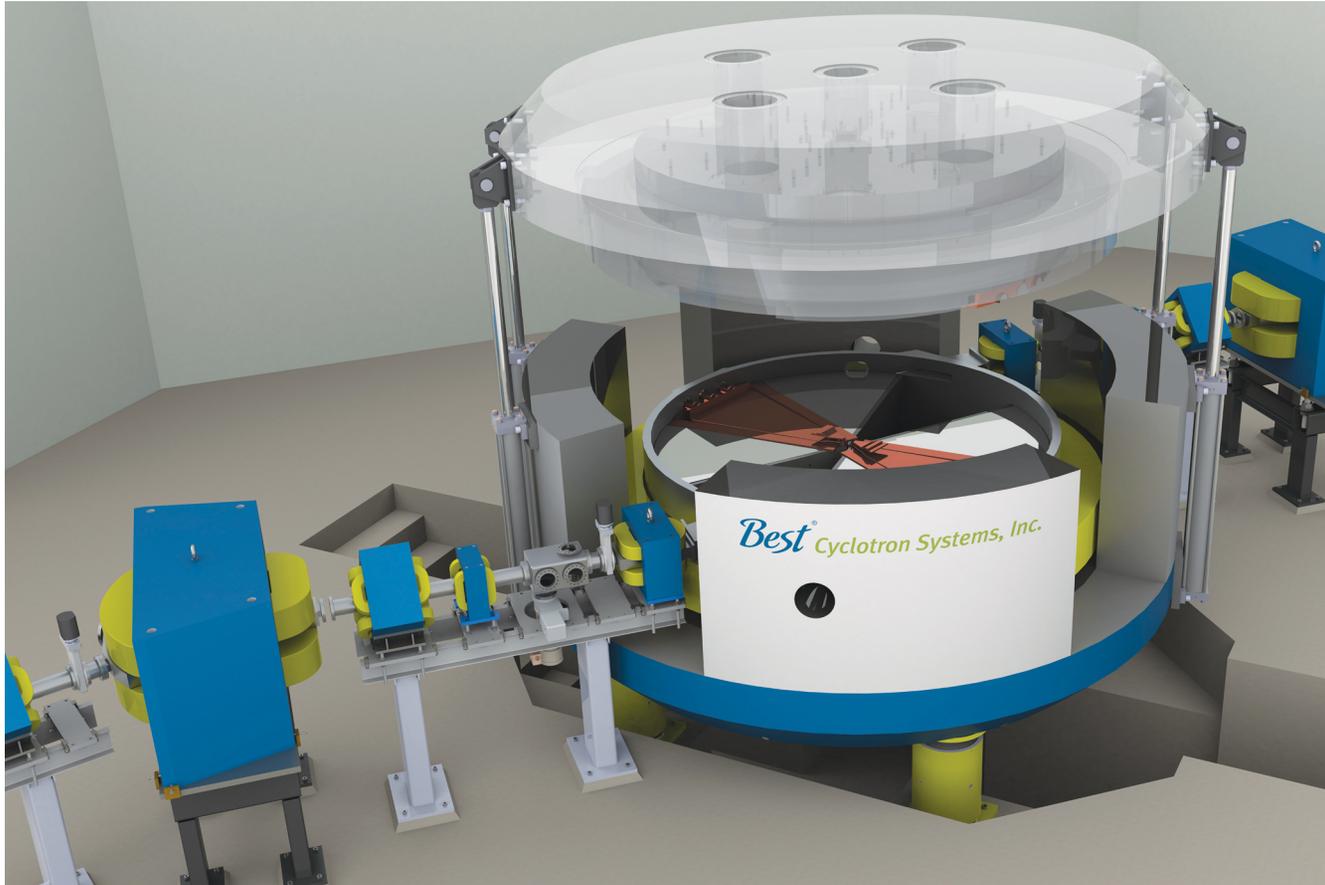
# BEST THERATRONICS MANUFACTURING CYCLOTRONS



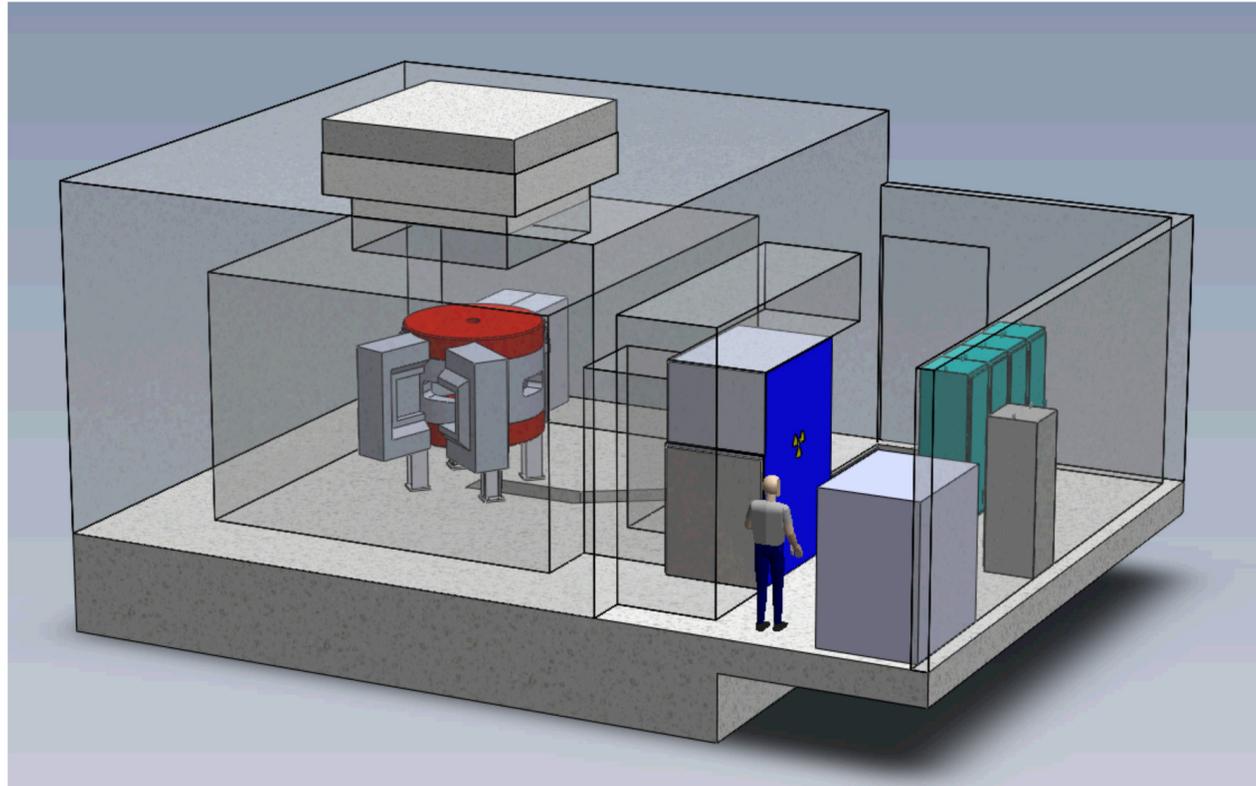
**160 Employees**



# BEST 70 CYCLOTRON (PROTON)



# BEST 14 CYCLOTRON VAULT



## BCS Offers a Broad Range of Cyclotrons

**TeamBest**, through **Best Cyclotron Systems (BCS)**, offers radioisotopes and production capabilities for nuclear medicine and radiotherapy with its range of cyclotron systems. **BCS**'s mission is to create technology to provide healthcare options for various needs around the world. Our staff assists from the planning stage, detailed design, facility construction, daily production, maintenance and emergency repair through the **TeamBest** network. We provide solutions for PET-CT and molecular imaging radiopharmaceuticals with the same excellent customized care as demonstrated in our 50-year history of radiotherapy support.

**TeamBest** offers **14 MeV (B14)**, **25 MeV (B25)**, **25 MeV upgradable to 35 MeV (B25u)**, **35 MeV (B35)** and **70 MeV (B70)** cyclotron systems to users. This broad range of cyclotrons provides end users with systems that can be tailored to their specific needs.



For instance, if a hospital complex requires an independent supply of positron emitting isotopes, then the **Best 14 (B14)** provides ready access to radioisotopes such as  $F^{18}$  for FDG and other  $F^{18}$  labeled imaging compounds. In addition, it provides a ready source for  $C^{11}$ ,  $N^{13}$ , and  $O^{15}$  labeled compounds that otherwise are not accessible from central radiopharmacies. The **B14** has an option that will provide  $F^{18}$  compounds for broad distribution and as such is a cost effective workhorse for FDG production for large urban centers.

## Best 14

- 14 MeV fixed energy  $H^-$  cyclotron
- External ion source
- 400  $\mu A$  extracted proton beams
- 4 target positions
- 2 simultaneous extracted beams



The **Best 25 (B25)** provides additional proton energy to make some specific single photon (SPECT) radioisotopes available for users. Most notable is  $I^{123}$  where the majority of production yield is covered by the **25 MeV** energy beam. A group producing a specific radiopharmaceutical can, with the **B25**, produce their own input material to maintain independence and cost-effective manufacturing. The key feature is a unique design for each application that streamlines cost and production efficiency.



## Best 25

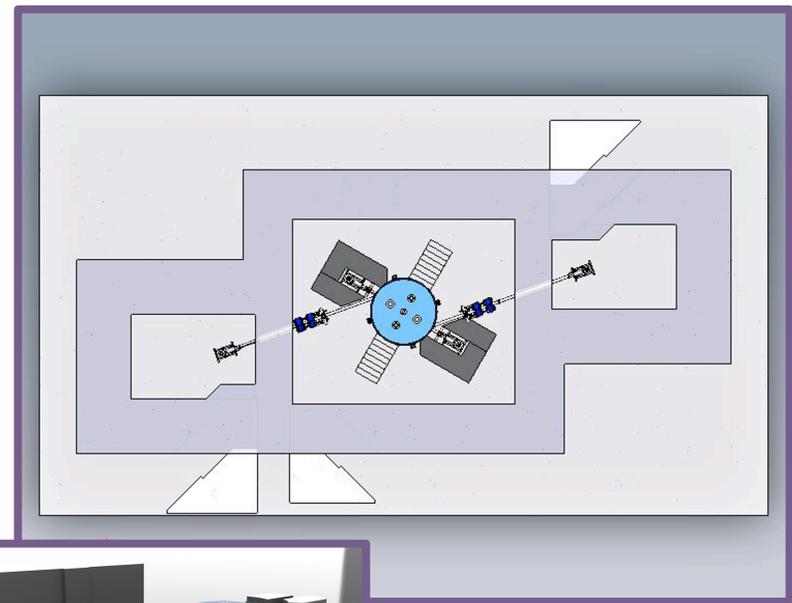
- 25 and 20 MeV fixed energy  $H^-$  cyclotron
- External ion source
- 400  $\mu A$  extracted proton beams
- 4 target positions
- 2 simultaneous extracted beams



The **Best 25 UPGRADEABLE (B25u)** has all the features of the B25 but may be upgraded to a **B35** when the user requires additional capability. The key upgrade feature is that the maximum energy of the **B25u** as delivered is 28 MeV. This provides about twice the amount of radioisotope that the **B25** delivers. A production facility based on the **B25u** is designed to allow modifications for the upgrade to the **B35**.

## Best 25u Upgradeable

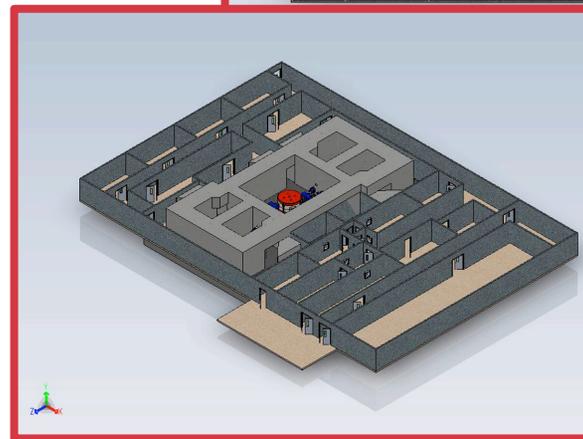
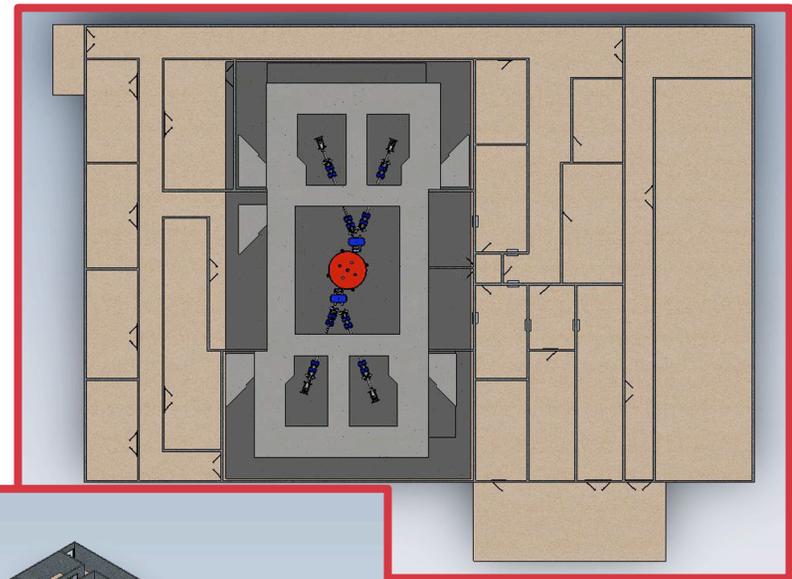
- 28 and 20 MeV fixed energy H<sup>-</sup> cyclotron
- External ion source
- 400  $\mu$ A extracted proton beams
- 4 target positions
- 2 simultaneous extracted beams



The **Best 35 (B35)** extends the cyclotron capability to more medical radioisotopes for diagnostics and therapy. The majority of radioisotopes now in current medical use are accessible with this system. The energy coupled with **TeamBest** targetry that accommodates the high current, 1000  $\mu\text{A}$ , allows the **B35** to perform as a complete industrial cyclotron system producing commercial quantities of medical radioisotopes for a region and for a nation.

## Best 35

- 35–15 MeV variable energy  $\text{H}^+$  cyclotron
- External ion source
- 1000  $\mu\text{A}$  extracted proton beams
- 2 simultaneous extracted beams
- Up to 6 independent beam lines and target positions



The **Best 70 (B70)** reaches radioisotope production for heavy radionuclides. The additional energy penetrates the barrier caused by the highly charged target nucleus. Most notable, of course, is the production of  $\text{Sr}^{82}$ , the parent for  $\text{Rb}^{82}$  generators. Other high Z radioisotopes are also accessible with the **B70**.



## Best 70

- 70–35 MeV variable energy  $\text{H}^-$  cyclotron
- External ion source
- 1000  $\mu\text{A}$  extracted proton beams
- 2 simultaneous extracted beams
- Multiple independent beam lines and target positions



**TeamBest** provides a system that fits the needs of every customer. We offer a turnkey solution — not only the cyclotron, but also targets; automated radiochemistry; infrastructure; operations; and maintenance support. As consistent supplies of radioisotopes become more uncertain, particularly for reactor-supplied isotopes, the **TeamBest** family of cyclotrons provides a Total Solution™ for the medical community with less dependence on unreliable sources.

