BUCKLEY SYSTEMS
Ingenious at work

The light at the end of the tunnel:
Light Source Lessons Learned

Presented by Chris Philpott, CTO, Buckley Systems

Introduction

- About Buckley Systems.
- Synchrotron Light Source Projects.
- Challenges faced.
- Solutions.
- Lessons Learned.
- Opportunities/benefits.
- Questions

Greg LeBlanc

Head of Accelerator Science and Operations. 2003-2018.
The Australian Synchrotron.

He aha te mea nui o te ao. He tāngata, he tāngata, he tāngata

What is the most important thing in the world? It is people, it is people, it is people.

About Buckley Systems

- Founded by Bill Buckley in 1987
- Based in Auckland, New Zealand with partner companies in Boston USA and Canada (D-Pace)
- ~300 staff
- 4 sites in Auckland, 21000 m^2 of manufacturing and office space
- Passion for manufacturing precision particle accelerator equipment

What We Do

- Design, manufacture and test, particle accelerator equipment and subsystems
- Focused on electromagnets, associated support structures and vacuum chambers
- Also produce ion sources, beam diagnostic equipment, electrostatic and RF equipment, permanent magnets, targets and shielding
- Integration of mechanical, electrical and vacuum services together with control and data acquisition software to produce more complex systems

Our Key Industries

Semiconductor

Medical

Research

Synchrotron Light Source Projects.

Australian Synchrotron

BROOKHAVEN NATIONAL LABORATORY

NSRRC 國家同步輻射研究中心 National Synchrotron Radiation Research Center

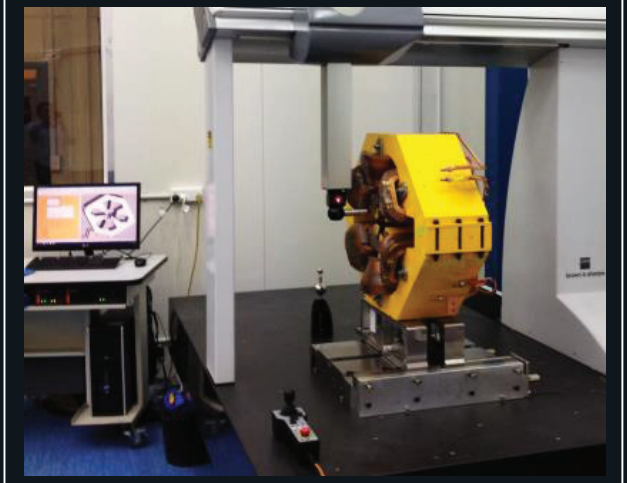
BROOKHAVEN
NATIONAL LABORATORY

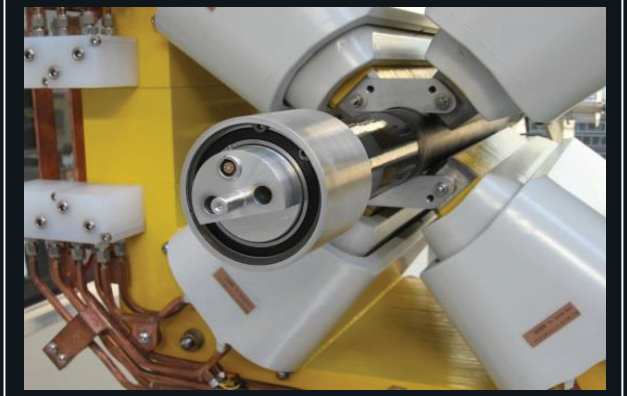
Challenges faced.

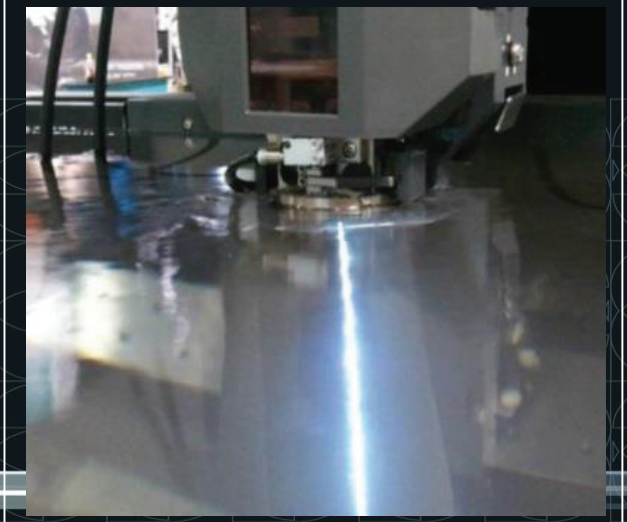
- Physics design
- Achieving mechanical tolerances
- Magnetic testing
- Manufacturing Capacity
- Keeping projects with unforeseen challenges on track

Solutions.

- Designing with FEA electromagnetic modelling software
- Developing new manufacturing techniques and test equipment
- On site accelerator staff







Mechanical tolerances

GENERAL TOLERANCES FOR LINEAR AND ANGULAR DIMENSIONS (DIN ISO 2768 T1)

LINEAR DIMENSIONS:

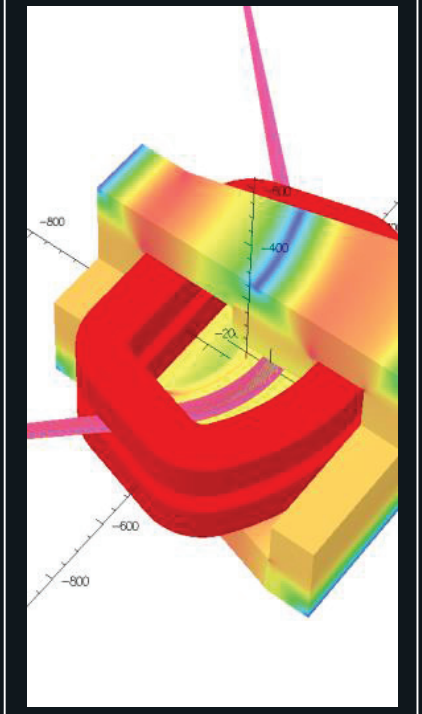
Permissible deviations in mm for ranges in nominal lengths	Tolerance class designation (description)		
	f (fine)	m (medium)	c (coarse)
0.5 up to 3	±0.05	±0.1	±0.2
over 3 up to 6	±0.05	±0.1	±0.3
over 6 up to 30	±0.1	±0.2	±0.5
over 30 up to 120	±0.15	±0.3	±0.8
over 120 up to 400	±0.2	±0.5	±1.2
over 400 up to 1000	±0.3	±0.8	±2.0
over 1000 up to 2000	±0.5	±1.2	±3.0
over 2000 up to 4000	-	±2.0	±4.0

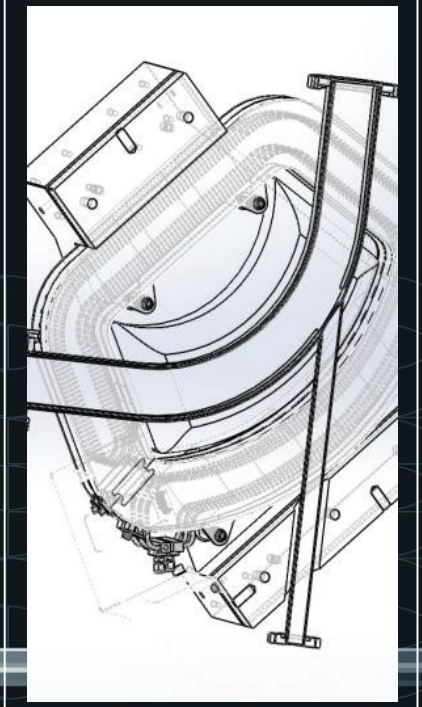
Lessons Learned

- Specifications/statements of work should be comprehensive and well defined but not be overly restrictive or over specified. Only include what is important.
- Be clear on where alternatives can be considered.
- Be clear on what is nonnegotiable.

Lessons Learned

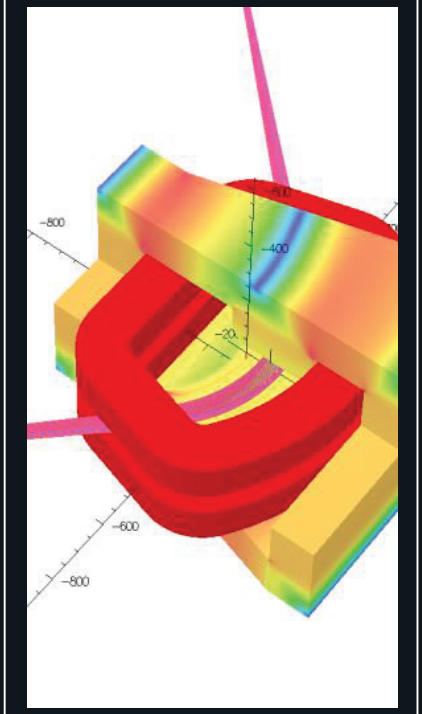
- Customer provided reference designs are an excellent starting point when handing over a design to a vendor. At the very least they are a reality check that specifications can be met.
- A mechanical tolerance study with respect to specified magnetic field quality should also be carried out
- Get potential vendors involved as early as possible. Most vendors are happy to give advice without obligation. With modern FEA modelling software, scripts and CAD “skeletons”, near detailed designs can often be rapidly produced before an RFQ is issued

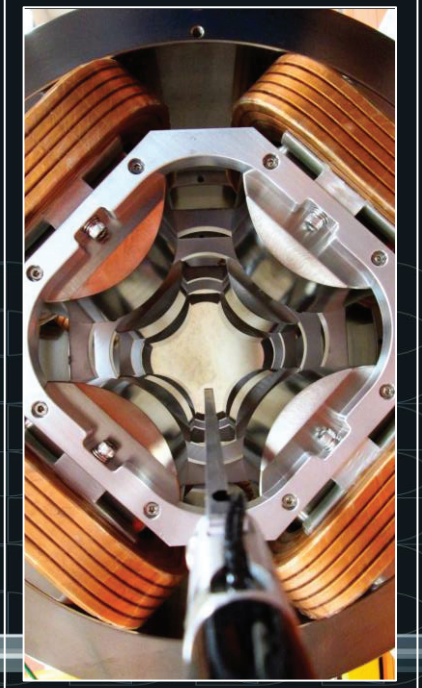




Lessons Learned

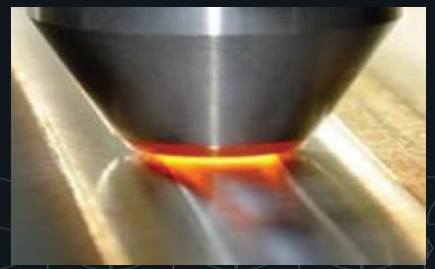
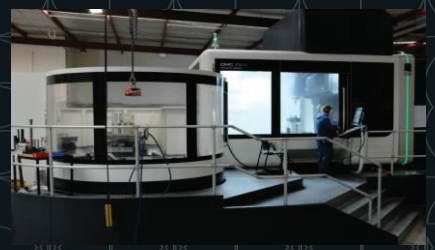
- Collaboration is key, the more involvement between customer/vendor technical staff the better.
- “Big Science” is a team sport. It is wise for the accelerator facility to offer advice/share knowledge in areas they have expertise and resource.
- Having customer staff at the vendor facility is invaluable. It builds trust, can quickly resolve issues and help keep the project on track.





Benefits

- Large projects are not necessarily a windfall, however at the right time they can offer considerable financial stability.
- “Big science” projects are prestigious and can therefore give a large boost to credibility, a proven track record is also often a prerequisite for future projects.
- The real benefits are growth in technical knowledge/contacts, capability and capacity that can be applied to future projects as well as to other areas of the business.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