

Engineering in H.E. – an industrial perspective for a product development view point

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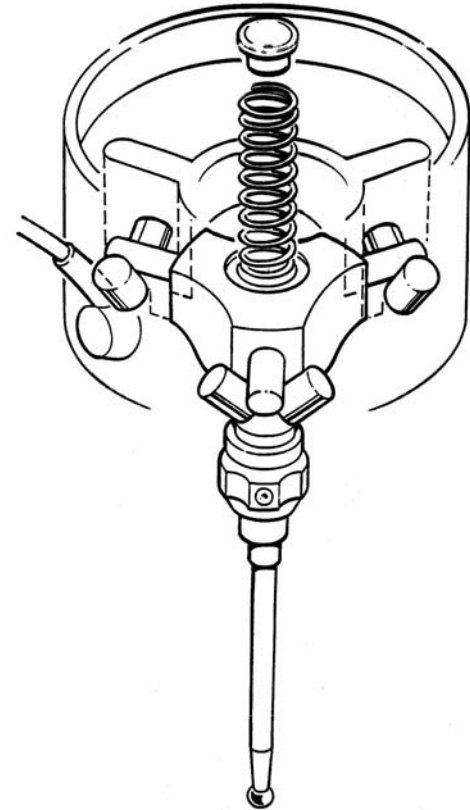
Wotton-under-Edge

Gloucestershire



Presentation Overview

- Who are Renishaw
- Product power
- Technology driver
- Industrial requirements From HE
 - People
 - Capability
- Issues
- Summary



Who are Renishaw?

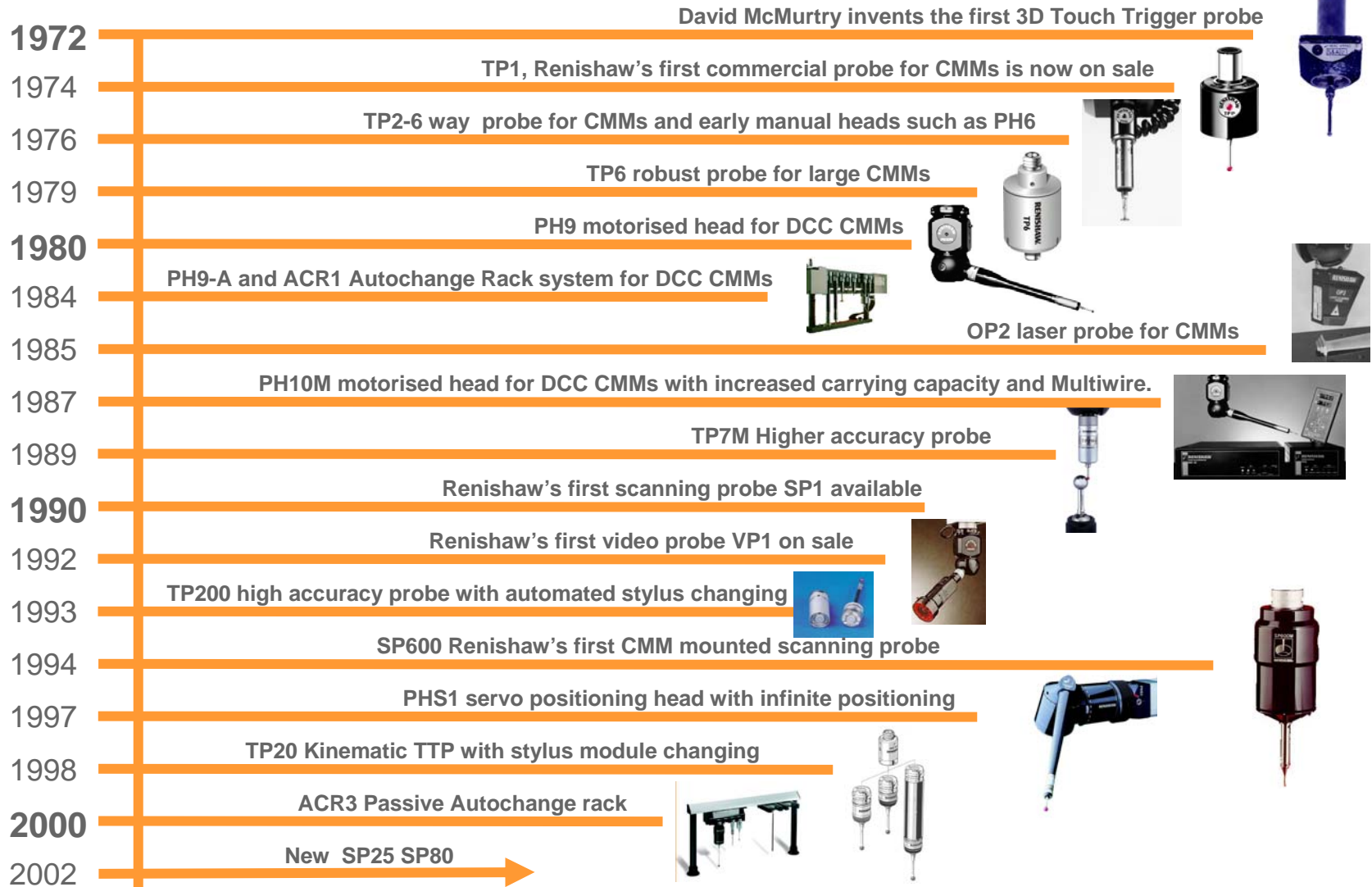


Makers of metrology equipment:

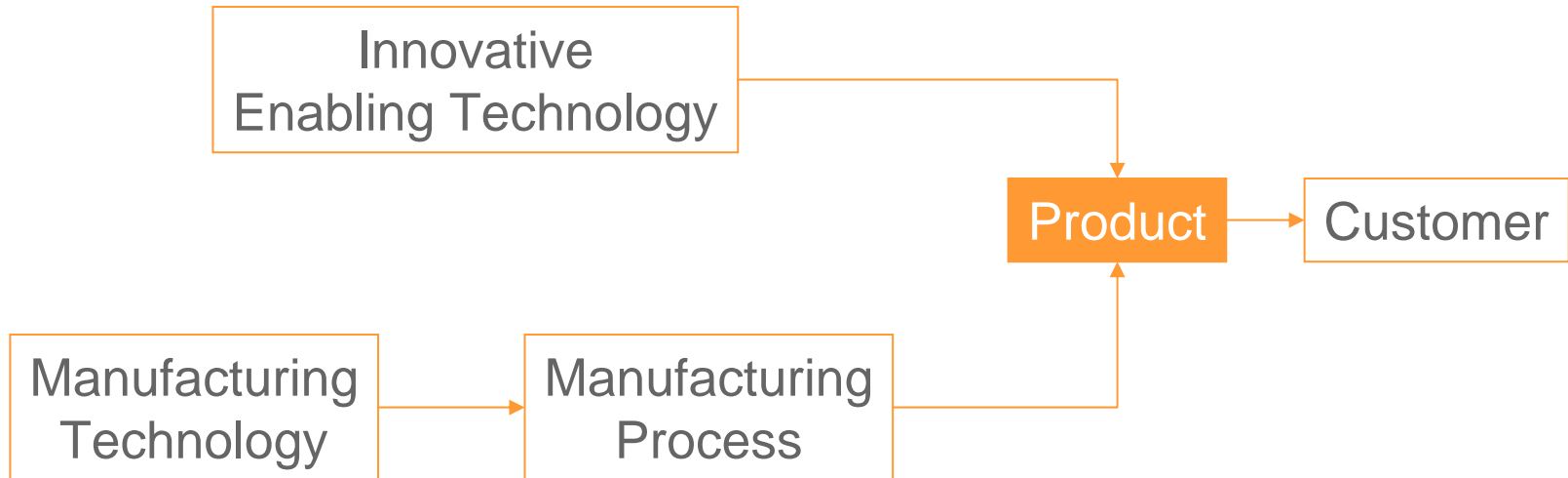
- Co-ordinate Measuring Machine (CMM) products
- Machine tool products
- Styli and Custom products
- Laser and Calibration products
- Encoder products

-
- Spectroscopy products
 - Dental products
 - Neuro products
 - Biodiagnostics products

Renishaw CMM developments since 1972



What drives us?



- We are a product lead company
- We succeed by constantly producing innovative new products
- We develop both growth and breakthrough innovations
- We employ innovative manufacturing technology to improve our overall business performance

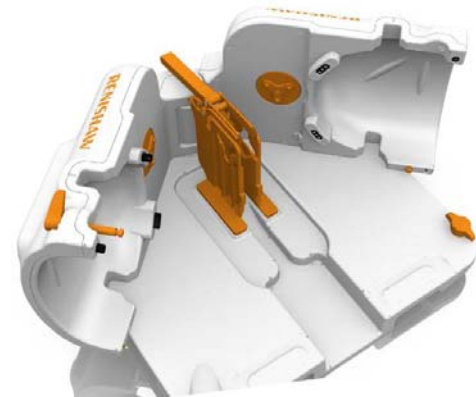
RAMTIC - A flexible manufacturing system

- RAMTIC - Renishaw Automated Milling, Turning and Inspection Centre



Product development and disruptive technology

- Disruptive technology - very powerful step change capability
 - New function / product capability
 - faster / better / smaller / lighter / efficiency gain / etc.
 - Cost reduction
 - Manufacturing process / cost / ownership / use / etc.
- Disruptive technology – very strong competitive
 - Quickly destroy a profitable business
 - Margins / investment / lockout? / etc
 - Quickly gain market share!!!!



Industry requirements from H.E.

- To leverage technical and human resources in HE sector for the benefit of all parties
- Access to “state of the art”
 - People, knowledge and equipment
- People
 - Graduates
 - Post graduates
- Knowledge and equipment
 - Capability / skills
 - Facilities



Industry requirements from H.E. - People

- Graduates
 - positives
 - Generally of a good standard and “fertile”
 - Enthusiastic but not always interested in their subject
 - Understand the principles of problem solving
 - Wide general knowledge of analytical tools
 - Negatives
 - Little or no practical experience
 - Poor exposure to practical tools / manufacturing knowledge
 - Flow chart mentality
 - Don’t know how to apply learning
 - Need to be a “jack” and a “master”



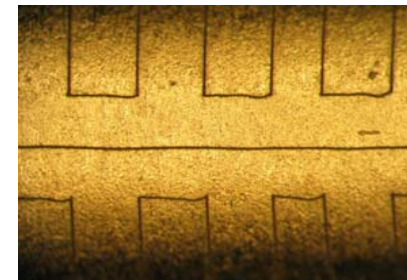
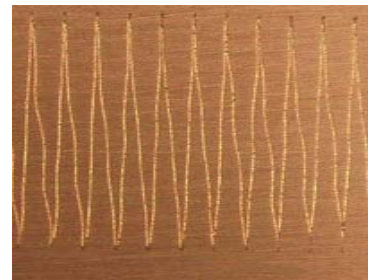
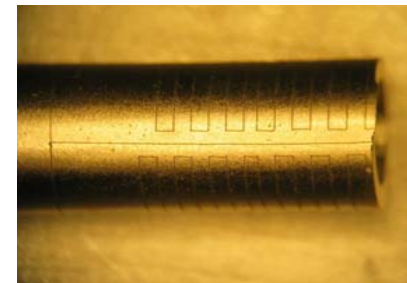
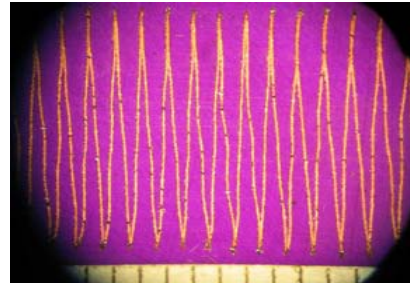
Industry requirements from H.E. - People

- More empathises needed on areas
 - Teach design process through to testing prototype
 - Risk management / too risk averse (wider knowledge?)
 - Use projects to encourage more industry involvement
 - Understanding of the patent process
 - Cross sector understanding eg healthcare, environment
 - Commercialisation options
 - sales channels / distribution / licensing / service model / funding
- Industrial guest lectures / visits
 - Real world examples
 - Expand horizons



Industry requirements from H.E. - People

- Post graduates
 - Specialist knowledge in a focused subject area
 - Laser principle / not normally generalised or product focused
 - Not enough UK / EU candidates
 - DTC / Eng Doc students / process excellent
 - Strong industrial engagement
 - Commercial coupling / connect
 - Relationship builder



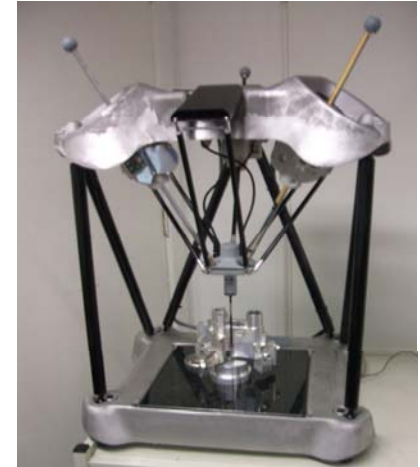
Industry requirements from H.E. - Capability

- Research or Development?
 - Successful commerce requires both growth (incremental) innovation and breakthrough (step change) innovation
 - Larger research projects (higher risk) better suited to examining opportunities for breakthrough innovation
 - Smaller, more numerous, projects better suited to growth innovation



Industry requirements from H.E. - Capability

- Where to do Research?
 - Fundamental research takes a long time to come to market!
 - Broad product research better done in-house
 - Build up portfolio in a sector
 - Ownership issues avoided
 - Acquisition generally quicker win and lower overall cost!
 - Needed to be the right fit (eg location, technology, cost)
 - Detailed focused research can be done in HE
 - Cost are on a par with in-house (FEC)
 - Best targeted at area with little expertise



- ✓ Lower production cost
- ✓ Easy installation
- ✓ Lighter weight
- ✓ Smaller Size
- ✓ Higher speed
- ✓ Comparable accuracy
- ✓ No air

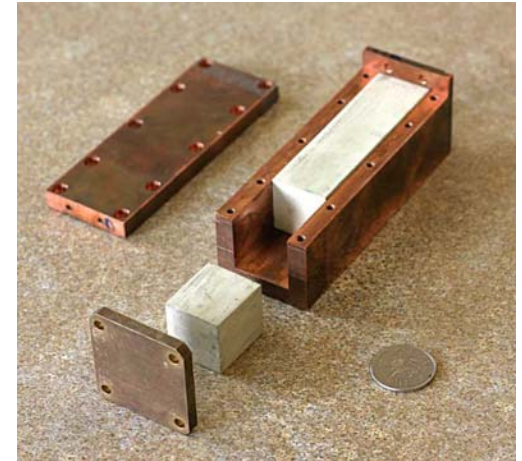
Industry requirements from H.E. - Capability

– Staff

- Possess skills / knowledge in demand
- Continuous re-invent and evolve
- Seek out industrial problems / connect companies
- Work across sectors / pull in other depts.
- Have a balanced research portfolio, blue sky & applied
- RAE conflicts?
- Use short projects and large platform

– Facilities

- Equipment, use both for teaching and research
- Attract other companies with capability



Fibre Input

Focussing optics

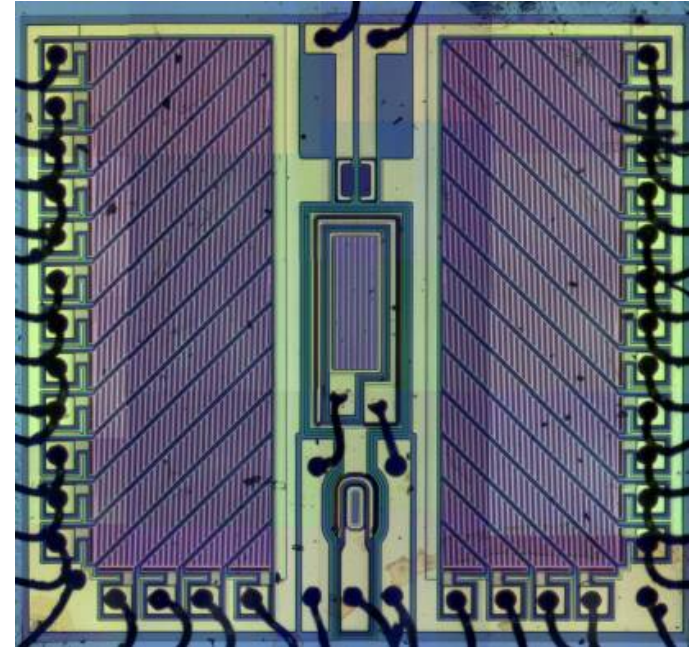
Cost reduction



- Constant business pressures are reduction of variability and reduction of cost
- In a high wage economy like the UK, innovative *processes* are vital
- We need to attack many sources of cost – poor quality, excess time, excess material, excess processing, excess labour etc.
- This is always a business priority although it may not appear to be a “hot” research topic!

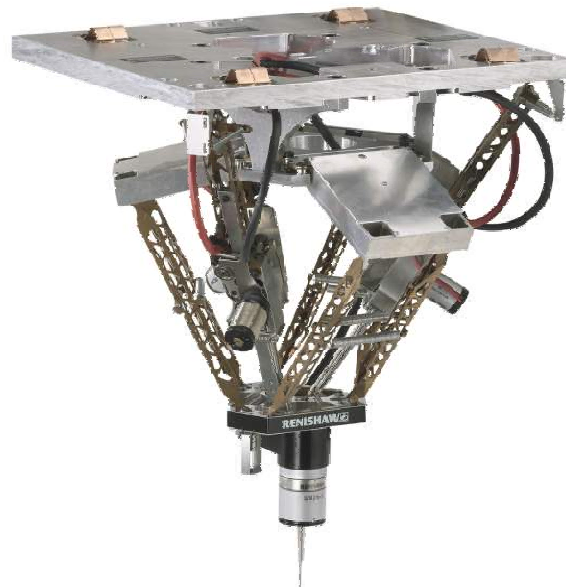
Intellectual Property

- Intellectual Property, protected by patents, is a major competitive tool for companies like Renishaw
- Universities have recently become much more aware of the need for wise IPR handling
 - Poor understanding from the commercial departments
 - 1 (concept) : 10 (demonstrator) : 100 (prototype) : 1000 (product)
- There are several apparent conflicts between, for instance:
 - academic freedom and commercial secrecy
 - timely publication and the (often slow!) patent protection process
- These conflicts must be measured and managed up front
- Industry will tend to bear much of the cost of commercialisation and so will demand most of the IPR



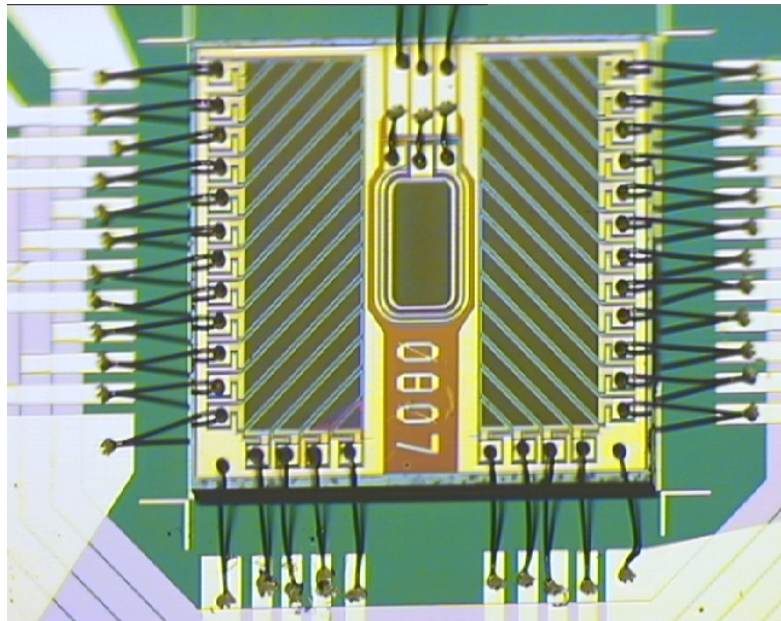
Ineffective collaboration – what is a turn OFF

- The “no-need” syndrome - touting a solution looking for a problem
- “Over promising” for large monolithic research grants
- Misalignment between “hot” research topics and important business priorities
- Misunderstanding of expectations of partners (in both directions!)
- Complex and binding research proposal forms, particularly financial ones
- Hassle over IPR.



Effective collaboration – what is a turn ON

- Building an effective and enduring relationship between company and University (often specific departments and individuals)
- A flexible mix of larger research projects and smaller, quicker development and feasibility projects
- An ongoing, continuous programme of activities
- A balanced and spread out financial support structure
- An integrated approach to include student projects and graduate recruitment



Summary

- Universities and Industry can work well together
- We each have valuable things to offer the other
- We need to understand each other's goals and objectives as clearly as possible - Set realistic but stretch goals
- One size does not fit all!
 - knowledge, people and equipment
- Being upfront and clear about IPR is essential

• Success breeds Success

