

Appendix III

The subjects covered in interviews

A list of questions and topics was used in the interviews, sometimes simply as a questionnaire, sometimes as an aide memoir, in order to gain a degree of uniformity in response. In practice, of course, these approaches were modified to fit the structural components and the magnets sectors. The list was derived entirely from the responses gained from the Consultation Community during Phase 1; respondents were in most cases also asked to confirm, or otherwise, the previously determined priorities.

1. MARKETS

1.1. Which factors will significantly affect the UK PM industry ?

1.1.1. Automotive components

Technology change Camless engines, Hybrid vehicles, Electric cars, CVTs, VVT camshafts, Electric motors, Sensors, Dashboard instruments, Noise reduction, Safety systems e.g. air bags, ABS, fuel cut off, On-board computers, Entertainment systems, Communications, Bonded magnets, Other e.g. shielding
'Better properties' components, Higher density components

Social change Emission control, Transport policy

1.1.2. Other components

Technology change, Functionally graded materials, Medical implants, Nanopowders, Intermetallics, 'Better properties', Higher density processing, Soft magnets

Social change, Crime prevention, Leisure time increase, Aging population, Others

1.2 Should markets for newer technologies be evaluated, such as functionally graded materials, implants and other medical applications, nanopowders, intermetallics, bonded magnets, HDDR, Nitromag?

If so, by whom?

1.3 Should markets for current technologies be evaluated to reduce dependence on the automotive industry?

If so, by whom?

1.4 What market developments would increase your sales tenfold?

1.5 If the developments in 1.4 took place what would the main factors be in meeting this increase?

Technical development, Capital expenditure, Technical personnel, Others

1.6 What are the long term threats to current markets and how do you think they could be overcome?

1.7 What constraints exist for UK companies in current global markets?

e.g. (for magnets) low cost ferrites, unlicensed Fe-Nd-B from China, Fe-Nd-B patent constraints., high priced Fe-Nd-B powder, overcapacity in Fe-Nd-B production/supply

1.8 Which new products have you brought to the market in the last 5 years?

1.9 If you were able to achieve 1.8, how was it accomplished?

Identified by company, In collaboration with end user, Brought to you from external source

1.10 If you were able to achieve 1.8, what help did you receive from outside company sources?

2. ENVIRONMENT

2.1 Which environmental factors will significantly influence the PM industry in the UK?

Processing Climate Change Levy, Processing with less energy, Waste including Packaging, Conservation of materials

Legislation End of Life Vehicle, Integrated Pollution Prevention Control, Hazard Classification, Classification of Alloys, Environmental Liability

2.2 Would you support a joint approach to environmental, and health and safety issues across the UK PM industry?

e.g. through EPMA secretariat?

2.3 Would you collaborate with others?

e.g. trade associations, other companies

3. TECHNICAL PROBLEMS

3.1 Materials

Materials characteristics identified in the first Phase of PM Foresight as being in need of improvement were, in order of priority:

Fatigue life, Consistency, Dimensional accuracy, Cost of production, Toughness, Ductility

Parameters needing attention to yield necessary improvements were: Density, Chemical composition, Powder characteristics

3.2 Would you support collaborative work across the supply chain (powder producer to end user) on the above to improve materials? e.g. by

powder compaction technologies, rotary and uni-axial compression, low alloy prealloyed, powders, surface densification, replacement of nickel in alloys, liquid phase sintering, powder compressibility, computer simulation of compaction

3.3 Can you suggest what work should be undertaken?

3.4 PM Processing

The following were identified in order of importance for improving consistency of PM structural parts: Sintering, Compaction, Die fill, Powders

In particular, specific areas need attention: Green compact handling, Green compact density measurement, Movement of compact/component, Computer simulation of die filling

3.5 Would you support collaborative work on any of these areas?

powder transport from hopper to die, powder flow, powder mixing/demixing, die wall lubrication

3.6 Can you suggest what work should be undertaken? e.g.

with chemical industry collaboration, with pharmaceutical industry collaboration, with ceramics industry collaboration

3.7 Secondary Operations

Improvement was suggested in the following areas: Hard turning, Sizing (dimensional adjustment), Grinding, Conventional turning

3.8 Would you support collaborative work in these fields?

- 3.9 Can you suggest what work should be undertaken? e.g.**
cutting tool material development, grinding wheel composition development, coining and, sizing lubricant improvement

4. MATERIALS ASPECTS

- 4.1 Do you agree that materials data are required for designers?**

If so, are you prepared to collaborate in generating data for such use?
Collated by EPMA?

- 4.2 Materials development (magnets)**

The need for new materials to expand the market was identified in Foresight1. Improved properties centered around necessary developments in: Temperature coefficient, Curie point, Cost of production, Corrosion resistance

These improvements, in turn, were expected to stem from better: Surface coatings (Fe-Nd-B), Process automation, Powder characteristics and flow, Density, Chemical composition

Do you agree that new materials are needed?

Would you support collaborative work across the supply chain (powder producer to end user) on the above to improve materials? e.g. by: Improvements to current material characteristics, Research and development of a new series of materials

Can you suggest what work should be undertaken and how it should be organized?

- 4.3 Materials processing for magnets**

It was suggested in Phase 1 that, to improve magnet processing, the following need attention: Cold isostatic pressing as a primary operation, uniaxial compression technology, Liquid phase sintering, Tool coating technology

5. FUNDING

- 5.1. On what basis are you prepared to commit funding to collaborative projects with other companies in the supply chain?**

- 5.2 What is your preferred type of collaborative project?**
with other PM companies, with Universities, with RTOs, mixed

- 5.3 What kind of funding arrangement do you prefer?**
own funds, European, DTI, EPSRC

- 5.4 How should the collaborative programmes be administered?**
- by a lead organisation (company, university, RTO)
- powder handling/delivery task force under EPMA

6. CENTRES OF EXCELLENCE

- 6.1 Do you wish to have Centres of Excellence for the UK PM industry?**

- 6.2. Where should they be, and what should they cover?**

- 6.3. How should they be funded?**

- 6.4. Would you support a CoE?**

6.5. Should there be a CoE based on EPMA, probably European in scope on the US model?

7. EDUCATION

7.1 Do you agree that there is a need for education of design engineers, in industry, in PM technology?

7.2 Would you support initiatives to tackle this problem? e.g.
by collaboration with universities, by collaboration with trade associations, by collaboration with professional institutions and learned societies, by collaboration with other PM companies

7.3 Do you have any suggestions?
e.g. technical articles in journals, Eureka, prize for novel design in PM, visiting, university lecturers, case studies, develop expert system for PM for design use

7.4 Do you agree that PM education at University level requires change?
If so, in what respect? e.g. visiting industrialists, teach PM to mechanical engineering students

7.5 Would you support an IDGS (Integrated Graduate Development Scheme) on Powder Metallurgy, either by supplying candidates or lecturers and lecture material?

8. GOVERNMENT POLICIES

8.1 Are there any specific government actions that you could suggest that would aid the growth of the UK PM industry?