FOCUS ON MICRO & NANOTECHNOLOGY

• Major push in MNT sectors.

• DTI and RDAs investing heavily in supporting microfabrication.

• UK-LMC established in 2005 as the national Centre of Excellence for laser micromachining.

• Primary aim of UK-LMC is to provide laser micromachining services to UK industry and research:
  - Commercial service  - Fast Response  - No Job Too Small

UK-LMC: wide customer base covering many sectors in UK and Europe. Experience of working with large companies, SMEs, research centres.

MNT is an umbrella covering many technologies – Precision is the key.
TYPICAL ‘MNT’ CUSTOMERS

REQUIREMENTS

• **Materials:** glass, polymers, silicon, thin metals, thin films, composites.

• **Features:** holes, slots, channels, complex shapes in 2D/3D parts.

• **Quality:** high precision, tight tolerances, precise control.

• **Dimensions:** ~1um to ~500um.

EXPECTATIONS

Produce desired features in selected materials to design specification and deliver high quality finished article.

Fast turnaround, competitive prices, 1off to larger numbers.

Novel designs and product ideas – make something for the first time.

Basic demands are similar to ‘traditional’ users of laser machining – except for smaller features, tighter tolerances and wider range of materials.
FABRICATION TRENDS

• ‘Nano’ tag on many products, fabrication of most parts on micro scale.

• ‘Traditional’ precision products are extending into the micro domain.

FABRICATION NEEDS

MNT companies require microfabrication

Non-MNT companies require precision parts

MNT-PRECISION LASER JOB SHOP
LASER JOB SHOPS

TRADITIONAL

- Well-established.
- >100 in UK.
- Highly competitive market.
- Integral part of supply chains.
- Pressures on pricing.
- Fast turnaround for ‘standard’ jobs.
- Mainly metal cutting & welding.

MNT-PRECISION

- Relatively new.
- ~6 in UK.
- Niche expertise areas.
- Diverse customers.
- Work gained by level of expertise.
- Delivery governed by complexity and novelty.
- Any material.

Operating model for traditional job shops can be applied to MNT-Precision sectors as demand grows.
ROUTE TO MANUFACTURE - 1

DESIGN

- Material choice.
- Tolerances.
- Quality issues.
- Manufacturability.
ROUTE TO MANUFACTURE - 2

CONVERSION

- Transfer design into suitable format.
- Account for laser machining process.
- Decide on type of laser and method of machining.

Laser cut paths defined.
ROUTE TO MANUFACTURE - 3

MACHINING

- Set-up laser tool.
- Optimise process for job requirements.
- Produce parts.

Finished part in 25um stainless steel

1mm

100um
Complete service from design advice, process optimisation, production.

- Quote for work (price, deliverables, completion time).
- Deliver parts on time according to quote, including report on work with pictures of results.
- Service includes free advice on design and manufacturing options.
MICROELECTRODES SENSORS

Demetallisation of 30nm gold on glass.
Electrode pattern is ~4mm x 3mm

• High resolution patterning of complex features.

• Rapid, scalable technique for the production of multiple samples.

Sectors: Microelectronics, Sensors, Biotech
MICROMACHINING OF POLYMERS

150um holes

Sectors: Biomedical, Electronics

VIDEO
MICROFLUIDIC DEVICES

50 µm wide x 45 µm deep microchannels in polycarbonate

• Ideal for rapid evaluation of different designs.

• Highly flexible technique.

• No requirement for new masks for each stage.

Sectors: Medical, Biotech, Nanoparticles
MACHINING EXPERTISE

Slots in Ø125um fibre

Ø50um microlenses in polymer

50um wide bars in nickel

Cutting of 6” silicon wafer

Precision tasks,
Standard service

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• Precision engineers can now expect the same laser micromachining service as that provided by ‘traditional’ laser job shops.

• Fabrication demands and needs of MNT and Precision users are very similar.

• Traditional laser job shop model can be applied to the MNT-Precision sectors.

• Ease of access and high-quality service provision are extending the uses of lasers into new areas.

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