

# An initiative to raise safety standards in laser materials processing machines

Mike Green

In was over a few cups of coffee shared between Dean Carpenter (Laserite) and Andy Toms (TLM Laser), neighbouring stand holders in the AILU pavilion at MACH 2012, that the seeds of a potential new safety initiative were born. Like many in the laser community [see, for example, the piece by Martin Sharp 'Laser processing in schools and colleges' in Issue 65], Dean and Andy were concerned about the proliferation of unsafe (and often though by no means always, low cost) laser processing machines, especially when they get into the hands of users who are largely unaware of the hazards these machines can present. They would like to see AILU address this matter, or at least provide the focus for those who share such concerns to see what can be done to get the message out to those selling and buying noncompliant laser materials processing machines.

### Compliance requirements

Any laser processing machine put into service inside the EU has to be CE compliant, including in particular laser machines imported from outside the EU. Anyone selling or building a machine outside of the EU can claim to be CE compliant but it is the European importer or the manufacturer's representative within the EU who is responsible for declaring the product as CE compliant and producing a Declaration of Conformity certificate.

Compliance for laser machines includes meeting the requirements of the Machinery Directive 2006/42/EC series and the EMC Directive 2004/108/EC as a minimum. As part of this process there are harmonised standards to be met, including BS EN 60825-1 'Equipment classification and requirements' and BS EN ISO 11553-1 'Safety of machinery - Laser processing machines -- Part 1: General safety requirements', and others. The Declaration of Conformity certificate must clearly state the standards that the product is claiming to comply with.

A key point about the compliance process is that a manufacturer or EU importer can, wilfully or in ignorance, claim that a product is CE compliant. It

is up to purchasers to satisfy themselves on that point, though if there is a serious complaint or accident involving a product then government agencies, the Health and Safety Executive and/or Trading Standards may take action.

### The fume hazard

The most obvious hazards posed by a laser materials processing machines are generally the laser beam, mechanical and electrical hazards and the machine design should isolate these hazards from the machine operator in normal operation. There are other hazards too, depending on the machine design, the laser type, the laser process and the materials being processed but the most persistent and potentially hazardous to health is the fume hazard:

- i. The nature of the fume, in particular the quantity and potential toxicity of the fume components depends on the material being processed, which is under the control of the user;
- ii. Machines are often imported without fume extraction, leaving it up to the importer or end user to provide this;
- iii. An underpowered extractor and poor local extraction design (air flow in as well as suction), leading to an accumulation of particulate (dust) inside the machine that is released into the workplace during maintenance and servicing and that can present a fire/ explosion hazard in combination with the laser beam.

So it is, that through a combination of ignorance and cost saving, those involved in laser safety come across all too many cases of fume extraction that is badly designed and/or underpowered, and thereby presenting a long term risk to the health of the machine operator.

### The challenge for importers

The key points for importers are: (i) if an EU supplier imports potentially unsafe products, they carry the same legal risks as if they were the manufacturer, and (ii) It is not enough for the importer to ask the overseas manufacturer for certificates of compliance to their country's regulations.

### The CE label



Note the shape and the spacing of the approved label above.

**This is not to be confused with the China Export label below nor other non-CE markings:**



Importers should bear in mind that dishonest exporters can fabricate whatever paperwork they want and a real test certificate may not apply to the actual goods (i.e. made in the same workshop, and out of the same components); also that unless the importer has a contract that is enforceable in the country of origin then the manufacturer may be at no legal risk when selling products bearing marks that are intended only to deceive consumers. The 'China Export' label is one such example.

If the product proves to be noncompliant when it arrives into the UK then the responsible importer will ensure that it is made compliant before it ends up in the customers hands. Sadly, it seems that a significant amount of the non compliant laser processing machines ends up with the end user without being brought into compliance.

### The challenge for laser users

Through web portals anyone can import low cost equipment and a trend is growing for people jumping on the bandwagon insofar as lasers are concerned.

The main challenge for users goes well beyond laser machines, to attitudes towards health and safety at work in general and in particular taking responsibility for safety in the workplace. Just as the EU importer bears full responsibility for the safety of the product, so the organisation that purchases the equipment bears a legal responsibility through

health and safety legislation for providing a safe place of work.

CE noncompliance is not restricted to low cost machines; rather, the underlying problem is people being tempted by price rather than whether the machine is fit for purpose.

Factories, commercial companies, schools, colleges hospitals and research places all have a DUTY to operate equipment safely and to ensure the safety of users. Despite the financial pressures, due diligence must be exercised to ensure that the laser processing machine is fully CE compliant before it is purchased, even if this excludes the low cost option. Apart from anything else, in the event of a serious incident (fire, loss of life etc.) caused by the noncompliant equipment the organisation may find that it is not insured for the loss.

#### What to look for in a laser machine

Mike Barrett (Pro Laser) suggests a potential purchaser should start with a simple check that might indicate that a laser machine is noncompliant:

- **Labels**  
Clearly the machine should have a manufacturer's label and this should include a CE mark, not to be confused with a 'China Export' label (see box opposite) and the supplier should be able to provide all the necessary supporting documentation.
- **Points of user access**  
Identify any hinged or sliding panels that are points of user access for normal operation, such as the top opening lid of a small flatbed machine. All should be equipped with proper safety interlocks i.e. interlocks that fail to safety and are difficult to defeat without a key, in contrast with the common micro-switch, which can fail on both counts. If you find nothing or a micro-switch it is likely that the machine will not conform to the machinery directive.  
  
Also check that the panels have warning labels fitted, such as "CAUTION: INVISIBLE CLASS 4 LASER RADIATION WHEN OPEN AND INTERLOCK DEFEATED".
- **The Emergency Stop**  
Check that the machine has a clear, accessible Emergency Stop push button with a lock down feature.
- **Fire safety**  
Check that any material in line of sight of the laser beam is non-

flammable. For plastics the usual material of construction (for CO<sub>2</sub> lasers) is polycarbonate, which does not readily catch fire, unlike acrylic (perspex).

Galvanometer scanning laser systems, of the type commonly used for marking, will incorporate sensing devices that can cause the laser to be switched off should the mirrors become stationary. For (chart plotters) flatbed cutting systems stepper motor drives are often used to translate the turning mirror that directs the beam onto that workpiece, and these do not of themselves include motion sensing. Without independent motion sensing (in some arrangement this may include motion of the workpiece too), fault conditions could allow the laser beam to remain stationary on the workpiece, causing the workpiece to catch fire; and possibly the machine and then the building it is housed in.

- **Fume safety**

Check that strong local air flow and extraction is provided (e.g. by hand)

Get a quote from a reputable fume extract supplier and compare the power of the quoted unit with that of the unit that the supplier is proposing to provide with the machine.

#### What should AILU do?

The Association already freely provides information and advice to members on laser safety matters. In particular, the document library in the member's area of the AILU web site provides lists of standards for laser product performance and safety, together with processing standards and guides. Articles from all issues of The Laser User are also available for free downloading from the AILU web site.

The main issue for AILU in raising the safety standards for laser processing machines is the bad name that lasers could gain from the safety performance of noncompliant products, especially those that end up in places of further education.

The association is fortunate that Mike Barrett (Pro Laser) represents AILU on the main BSI and international standards bodies relevant to laser materials processing, and any benchmarks that a laser processing machine safety group in AILU might come up with could be forwarded for consideration.



To mark or not to mark?

AILU can also help as an independent source of information for potential users. At the present time there is a link to an information sheet on laser safety available on the AILU home page which could be expanded but the presentation of this information must be in a way that does not put potential users off using lasers: after all, lasers do have an excellent safety record.

A telecoms meeting will have occurred by the time this piece is published and members should have already been provided with an update and an opportunity to be part of the initiative.

For further information please contact the author.

#### Acknowledgement

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