

Excimer Laser Legends and Facts

Opinion: Excimer lasers are very expensive and require regular service, and there are much cheaper systems on the market with CO₂ laser sources

Comment: Yes it is true. Excimer laser sources are among the expensive laser sources and require regular service, but at the same time they offer many advantages. If price alone was the measure for equipment you certainly would not operate all that expensive machines.

Due to specific properties, short pulse duration (< 10 ns means 0,000 000 01 s) and the short deep UV wavelength of 193 nm Excimer lasers offer a quite unique marking flexibility and performance, providing a micro-crack-free smooth and marking result on a wide variety of lens & mold materials.

Laser sources like CO₂, YAG etc. can certainly be lower in price, but they provide a rough and not smooth engraving as well as micro cracks, which later lead to several problems. Rough surface structures always show a capillary attraction, making it quite impossible to achieve even and smooth layers or vacuum coatings on them.

The reason is the cold ablation process during Excimer engraving in a quite molecular form providing a smooth surface. Subsequent processes like coating perform much better and much more efficient and there is no release of particles. The ablation product that deposits around the marking can't be considered as particles and can easily be removed in an ultrasonic cleaning process.

Question: Excimer lasers require a toxic ArF pre-mix. Isn't that very dangerous?

Answer: 193 nm Excimer lasers can only work with ArF pre-mix gas (pre-mix means that the gas comes ready mixed) and the gas regularly needs to be exchanged, in order to maintain the laser power stable. We have to confess that very at the beginning we ourselves were also somewhat worried about having a harmful gas in our premises.

After our long experience we can tell you that there is no reason to worry about that. Thousands of Excimers around the world use pre-mix gases in all kind of industries, hospitals etc. and the use of harmful gases is widely spread along the industries.

Furthermore, high power Excimer lasers require 5% Flour. In our case it is 0,16% (!) Flour density only.

Question: Isn't the regular required laser service very expensive?

Answer: It seems to be expensive at the first view, but if you look to the final marking costs including service and maintenance, you will find that the service costs are quite marginal, especially if you consider the high quality.

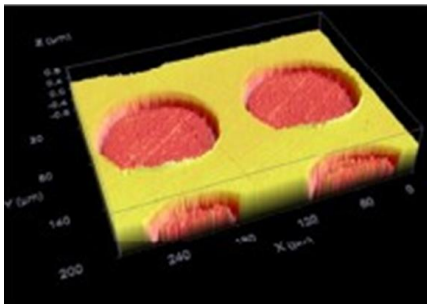
Question: Isn't such a complicated machine difficult to operate?

Answer: No. The opposite is the case, especially by compare with difficult CO₂ laser parameter finding. And we have put great care in making understanding and operation of the machine very easy. We have successfully taught operators in less than a day to fully operate the machine. During installation we give a 2 to 3 days training after which you will be absolutely familiar with our systems. And last questions can be clarified in dialogue via remote TCP-IP connection.

Question: Why is an Excimer laser better for engraving in optics and ophthalmics?

Answer: Longer wave length lasers like CO₂ and YAG heat up the substrate during engraving process. This sudden heating and later cooling leads to micro cracks and quite rough and uneven surfaces. Especially on organic substrates occasionally a reversible marking was observed, means the marking disappears or changes with the time or after heating up the substrates to 60-90 °C, temperatures easily reached in a car at summer time.

Excimer lasers with 193 nm wavelength and less than 10 ns pulse time do not heat up the substrate during marking and do not create rough markings or micro-cracks. The marking remains non-reversible and stable over the full lens lifetime.



REM microscopy result of 60 µm diameter dots

Number of pulses per dot	CR 39	HI 1.6	HI 1.67	HI 1.74
1	0,51 µm	0,29 µm	0,22 µm	0,22 µm
2	0,88 µm	0,57 µm	0,45 µm	0,44 µm
4	1,60 µm	1,14 µm	0,89 µm	0,87 µm

Engraving penetration = f (pulses / dot & material type)