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# FF Journal

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## The cutting edge

**INSIDE LASER OPTICS**

Phir's new Clear Magic  
ns offers unique laser  
otic capabilities

Creativity and  
innovation at the  
Precision Sheet Metal  
Technology Fair

# Seeing clearly

**T**here are three important features every laser system's lens should have: longevity, an easy-to-clean coating for durability and low heat absorption.

But few lens manufacturers have lenses that offer all three. When lasers start approaching power levels of 4 kW and higher, a lens' low heat absorption is critical to its lifespan. Thermally induced stress from the heat can crack or even shatter the lens.

When a high-kW laser is cutting thick materials, like 1/2-in.-thick stainless steel or 1-in.-thick steel, the spatter generated can hit and stick to the lens. A spattered lens can absorb more heat energy, and the dirt can focus heat in that area, which can eventually cause the lens to fail.

Usually, lens manufacturers solve this problem by using a durable lens coating that won't let spatter stick to it and enables easy cleaning.

The composition of the lens is just as important. Although every lens starts out using a zinc-selenide base, the proprietary coatings the manufacturer applies make all the difference for the lens' capabilities.

## Making magic

Ophir Optics Inc., North Andover, Mass., makes two lenses that offer longevity, an easy-to-clean coating and low heat absorption. One is the Black Magic lens, and the other is the new Clear Magic. With the former, the company guarantees a maximum absorption of the laser beam's energy level of just 0.13 percent.

The Clear Magic offers the same unique characteristics of the Black Magic while providing the benefit of a coating transparent to visible light. The new lens

## New Clear Magic lens offers unique laser optic capabilities

has the same excellent cleaning properties and scratch resistance as the Black Magic, says Dan Sherman, Ophir's regional manager of sales and marketing for North and South America.

Its transparent coating allows a helium/neon guide laser beam's light to be visible on the workpiece, showing the position of the cutting beam. Also, polarizing filters can be used with the lens to help detect thermally induced stress.

"The Clear Magic was developed basically for CO<sub>2</sub> lasers with 3 kW of power and above, and the reason is that the higher the energy of a laser system, the lower the absorption in the optics needs to be to make them last," says Sherman. "One of the advantages of the Clear Magic is that all optics absorb energy, and if you start out with the lowest absorption possible, then the optics should last longer compared to the lifetime of a regular lens."

Sherman also says that although the Black Magic was designed for higher-wattage lasers, Ophir found it also works

well with lower-power ones. Clear Magic can be used in 5-kW lasers and higher.

"The Black Magic is still a good lens, and it works well with highly reflective materials, such as aluminum and stainless steel, along with higher-power lasers," says Sherman. "Our Clear Magic lens offers an even lower absorption rate, and the guide laser beam transmission is excellent. While our competitors have lenses that have low absorption, we needed to differentiate Ophir from other lens manufacturers and [aid] laser manufacturers that are requiring lower-power absorbing lenses."

Sherman also says the basis for the Clear Magic's low absorption is its proprietary coating.

"In any particular lens, it's really the coating that makes the difference," he says.

As to the lifespan of the new Clear Magic compared with a standard lens, Sherman says it "varies from application to application. The cleanliness of the facility is important, along with the handling of the optics by the operators. Also,

having operators that know how to clean the optics is critical to having a lens last longer. So there's really no particular number that we can give a customer. What we tell our customers, though, is if they're getting X amount of hours with a standard lens, and they follow good maintenance practices, the lifetime should increase around 25 percent using our Clear Magic lens."

When a company looks for a lens, Sherman says it should always mention the application.

"They may not need the Clear Magic if they're using a low-wattage laser and cutting thin sheet metal because the Clear Magic is a little more expensive than a standard lens," he says. "What's important to us is the application, type of metal or material being cut and if they can give us an idea of how many lenses they've been going through. With this information, we can give them some idea of what they might expect if they use a Clear Magic, Black Magic or a standard lens."

But when Sherman was asked about job shops that use lasers that can be cutting 1/2-in.-thick aluminum one day and 1-in.-thick steel the next, or thin material for several days at a time, he says, "This is

a problem for job shops, and that's why we recommend having all three of our lenses if they're not cutting the same material on a day-to-day basis. They should change out the optics as to the application. However, if they have budget constraints, they can use a Clear Magic to cut any of the materials."

## Clean and clear

To test the new Clear Magic lens, Todd Jacobson from Laser Maintenance Group Corp., St. Charles, Ill., brought the lens to John Anessi, vice president at Prestige Metal Products, Antioch, Ill.

Prestige is a sheet metal fabrication job shop that started in the late 1940s. It has two lasers, and it cuts mild steel, aluminum and stainless steel.

"When they're cutting thick stainless steel and don't have a lens that has a low absorption rate, it'll break down quickly," says Anessi.

Prestige has been using Ophir's Black Magic lens.

"A person I was talking to said they had a Black Magic lens shatter, but it didn't actually shatter into pieces like when you lose a lens," says Anessi. "It just had somewhat of a hole in it. After we had an expe-

**The Clear Magic lens was developed for CO<sub>2</sub> lasers with 3 kW of power and above.**

rience with a lens that shattered, we decided to try the Black Magic and had excellent results with it."

"When the Clear Magic came out, I sent one there for testing," says Jacobson. "They were using the Black Magic, but it still wasn't the perfect answer for them. One of their complaints prior to using the Black Magic lens was when they cut 1/2-in. stainless steel, it was causing problems for their standard lens. They would get some spatter on it, and they couldn't clean it, which eventually destroyed the lens."

"When the Clear Magic ran the same job, it got spattered three times, and each time they were able to clean off the debris, and it just kept running."

In a test conducted in Japan by Ophir Japan on a 5-kW CO<sub>2</sub> laser using the Clear Magic lens, iron, stainless steel and aluminum were cut, and a high amount of spatter was intentionally produced.

The company cut three types of holes: 3 mm to 6 mm, 6 mm to 10 mm and 10 mm to 12 mm. After the tests, there was no spatter adhesion on the lens.

The Clear Magic lens was used for regular production, and during two shifts per day, it was cleaned three to five times a day. A standardized lens cleaning procedure was used. After cleaning, there were no lens scratches.

Ophir's Clear Magic lens is available in 1.5-in. and 2-in. diameter for most popular OEM systems. **FFJ**

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