Sustainable manufacturing for lens generating

Filtration and waste management started as a means to save companies money by reusing resources through their process. As the world has turned to sustainability and improving our ecological footprint, filtration and waste management technology has evolved, offering equipment that not only helps the environment, but helps the business too. In the optical and lens generating industry, we see this happening at an increasingly rapid rate.

By Jamal J. El-Hindi

The Environmental Protection Agency of the United States defines sustainable manufacturing as "the creation of manufactured products through economically-sound processes that minimize negative environmental impacts while conserving energy and natural resources".

Filtration in industry has always been an element of sustainable manufacturing. Although environmental conservation has not always been a priority in manufacturing, filtration has been a means to conserve natural resources and save money.

Optical lens generating requires hefty amounts of water and coolant to maintain clean and precise machining. Like many industries, it only made sense to invest in ways to reuse water and coolant, reducing operation costs.

Filtration — how to deal with waste?

Optical is by far not the only industry reusing coolants, oils, water, etc. Filtration among other industries has been a profound part of their process for a long time. So much, that large industries turn to specialized filtration companies to provide entire filtration systems.

In the optical industry, especially in the United States, we have only recently seen a rise in smaller labs expanding in size. This transformation brings all sorts of new obstacles to overcome, making it more practical to implement these same filtration practices from other industries. Most smaller labs got along just fine without any special equipment for filtration or waste.

As a lab gets bigger, however, it generates more waste, or plastic "swarf". Swarf generated from lens grinding takes up a lot of volume, and as labs grow, we see costs such as garbage disposal, hazardous waste removal, coolant, storage, and water increase.

Just the increased volume of swarf alone can cost labs a lot of money, not to mention how much coolant is being thrown away with that swarf. There is often more alloy and spent polish that needs to be disposed of as well. Alloy, being a hazardous material, has to be taken away by specialized hazardous waste companies that treat the waste-water. In some areas polish is also regulated, and must be treated as hazardous material.

These are not only concerning for the bottom line, but they also concern our environment. The waste from making lenses takes up a lot of landfill space. Plastics, such as polycarbonate and other thermoplastics used in lens manufacturing do not decompose for hundreds of years. They are also saturated in coolant if not properly dried, which leaches into the ground. Alloy water and polish compounds cause concern for the environment as well. These have hazardous metals that have contaminated entire sewage systems.

Optical is certainly not the first industry to encounter these hazards. The same issues have been present in several other industries for many years. Filtration specialists have been creating solutions for these issues, and only in recent history do we see some of that technology spreading to the optical industry.

One of the first obstacles to overcome is filtration itself. Filter technology has not only allowed companies to reuse their coolants, but has also provided clarity well enough to keep their equipment running longer. In the optical industry, cleaner coolant means changing the diamond tip tooling less often. The filter must also allow the waste swarf to discharge with as little coolant remaining in it as possible. In most industries you will see the filter with a long, steep discharge ramp. This is to allow sludge or swarf to drain for as long as possible before being discharged. In industries like copper production, we go as far as adding heaters and special reclaiming methods to dry and reuse as much of the waste as possible.

Labs start investing in briquetting technology

Copper mills will often reclaim their waste and run it back into their production. Many industries have seen the need to either reclaim or condense their waste. Briquetters or compactors have played a large role in condensing and reclaiming.

The optical industry has recently begun implementing this technology. What started as a means to reduce the volume of swarf waste, quickly became a means to retrieve more coolant. We are starting to see labs investing in briquetting technology as a goal to reduce their ecological footprint and help the environment. This has proven to save manufacturers thousands in coolant costs per month, making it a perfect choice for sustainable manufacturing.

The problem with briquetters, however, is that most are not designed for optical swarf. The first few in the industry were saw dust briquetters, which proved just how difficult lens swarf is to deal with.

After several years of development, there are now some options for compacting swarf and retrieving more coolant than ever. With swarf volumes being reduced to a 20:1 ratio, and squeezing nearly all coolant out of the swarf, this may be one of the most environmentally friendly advances in the industry.

Waste-water treatment

Many industries have had to implement systems for treating their waste-water because of how much they produce. As optical labs grow, so does their hazardous waste production. Some labs simply outsource their waste-water treatment by having

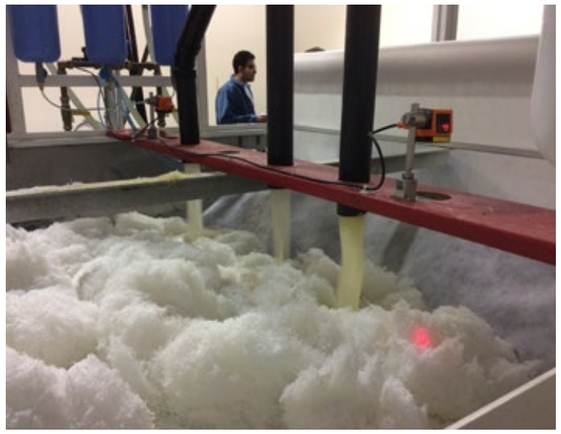

Fig. 1 *Bigger labs generate more waste.*

Fig. 2 *Some labs start investing in briquetting technology.*

Fig. 3 *DAC aqua distill water/waste recycler.*

companies pick up their hazardous materials. Some labs pour those hazardous materials down the drain. As environmental regulations increase and government focuses their lens on optical manufacturing, optical labs face some tough decisions.

Waste-water filtration systems

Filtration companies have been producing waste-water filtration systems for many years. Most of these systems were designed for much larger industries that typically have more space and more waste-water. All technology adapted to the optical industry must be functional and small enough to fit in an already crowded optical lab. In rising to this challenge, there are now new technologies available.

Waste-water evaporators and waste-water treatment systems seem to be the leading products available to labs currently [Fig. 3, 4]. Evaporators, although they take time and a lot of electricity, are great for isolating hazardous materials and removing them from the water, making hazardous waste a lot easier and less expensive to deal with.

Another waste-water treatment system uses a method that large waste-water treatment plants have been using for decades. They use an environmentally safe clay-based chemistry to latch on to the hazardous materials in the water, separating them entirely. The hazardous material can then be extracted by several different filtration methods [Fig. 5].

One of the prominent methods is using a centrifuge, which separates and condenses the waste material. This allows each lab to safely discharge the waste-water knowing it is free of hazardous materials. This technology is now conveniently

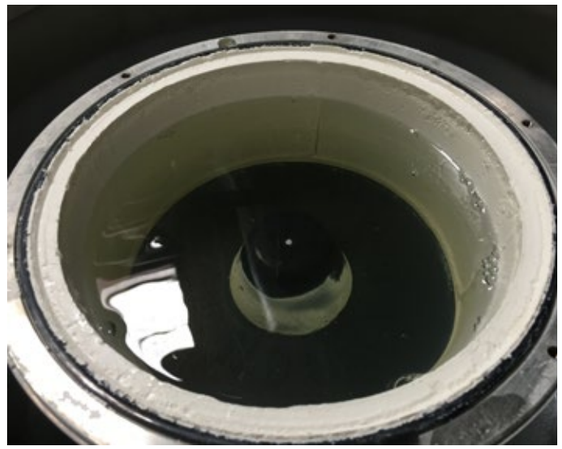

Fig. 4 *Waste water treatment.*

Fig. 5 *Waste water filtering.*

provided as a turn-key system for labs to treat their own hazardous process water, with the benefit of a smaller footprint.

The industry is growing and so are the challenges

As the optical industry continues to grow, there will be more issues to face, especially those regarding our environment. This can be especially difficult when policy, practice, and procedures vary across lens manufacturers.

It is difficult to compete when regulations in every country are different, and enforcement varies. It is critical then, that sustainable manufacturing technology continues to improve so that it not only helps protect our environment, but can be justified in cost savings. As this industry grows, it is on filtration and waste management that the industry will depend on for sustainable manufacturing. Filtration, compacting, recycling and waste-water treatment technology will be necessary so they can follow regulations without consequence.

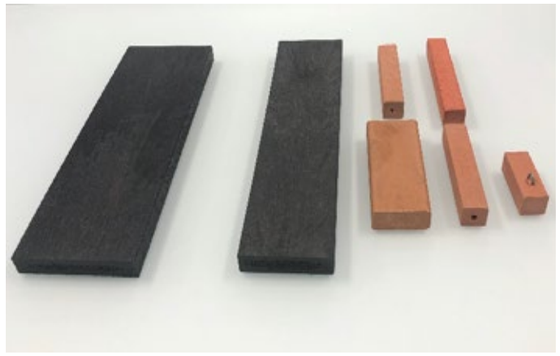

Fig. 6 *100% recycled content.*

As we look to the future of sustainable manufacturing, many are looking beyond simply reducing swarf waste and retrieving coolant. The industry has been asking what we can do with this waste and how to prevent it from ending up in a landfill. Many have been trying to answer these questions, and in the United States there is one group that has an answer. A development that is dramatically impacting sustainability in the lens industry is a new technology that enables recovery and recycling of lens swarf into permanently sustainable products.

From its Dallas headquarters, DEVCO Services is currently developing a North American network for recovery of densified swarf. The company's CEO, Alex Rankin, commented "We are focused on delivering value for the entire lens industry through recovery and conversion of swarf into a raw material used in production of quality products with positive environmental impact."

Their success in developing and selling a product from compacted lens swarf has given hope to the entire industry. As optical labs allow other industries to play a part, we will see more options for a cost-effective means of helping our environment and practicing sustainable manufacturing. ◆

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Jamal is a sales and field engineer for Filtertech with a Masters of Business Administration. As the third generation of this family-owned-and-operated company, he started at an early age building filtration equipment. After finishing his college career, Jamal began working as a field operator, fixing and maintaining filtration equipment across the world. With extensive knowledge of the mechanics and technology behind filtration, he began applying his experience in the field to engineering and design. Today, Jamal works directly with companies across the world, finding filtration solutions to meet the unique needs of multiple industries.