Central drying and conveying of plastics for optical applications

How Ultra Reflex is profiting from the installation of a central material handling system

Changing the materials handling from single dryers towards a Central Material Supply System has not only increased the qualtity standards and optimized the processes, it is also the base for a hazzle-free further expansion of the production capacity. Marcus Steiner, General Manager of Ultra Reflex, is reporting his first experiences with the central material handling system. It was designed in close cooperation with Labotek for the use with lens quality optical grade resins and is at the same time highly energy efficient, using the heat from the compressed air supply.

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Innovative optical components, reflector solutions, reflectors and safety reflectors is the core business of the family owned company headed by Marcus Steiner as General Manager. With 28 employees all processes like product development, tooling, production and sales are kept in house. Even the highly sophisticated tool inserts are produced at Ultra Reflex. Their products are used in light-barrier and sensor technology, equipment for streets, passenger and commercial vehicles and are opening up safety- and automation potentials. (And are the base for many safety and automation potentials)

Ultra Reflex moulding plant is encompassing 12 injection molding machines with clamp forces between 500 and 2000 kN, of which some are equipped with all-electric drives. With continuous investments in innovations Ultra Reflex is striving to stay up to date with their technology. The actual investment is towards a central material handling system. Until now the materials were dryed using mobile beside the press dryers of the Danish brand Labotek. Before the decision to move towards a central material handling system was taken, Marcus Steiner and his team spent a lot of effort to compare the concepts of several suppliers in the market and have finally chosen the concept of the supplier they have been familiar with.

In total the investment is encompassing vacuum-receivers for twelve injection molding machines, one central vacuum station, the manual coupling station, one central dry air unit and ten drying hoppers with gravimetric material throughput measuring, one central control including database and QM-functions and a heat recovery solution to use the heat from the compressed air system in the drying process.

The reflector manufacturing specialist is processing mostly optical or lens grade resins like PC (also in the HT-Version), PMMA, amorphous PA as well as the transparent polyolefins COP and COC (cyclic olefin polymer or copolymer). These materials have to be dried gently and carefully and need to be delivered to the processing machine with constant drying quality. While over drying is often resulting in color deviations, insufficient drying is mostly showing in surface flaws. “The central drying system is ensuring a consistent drying process, even if there are interruptions in the production process. The process is automatically controlled and documented. This data is important for tracing problems back to the material, and is allowing to draw conclusions towards the quality of the parts produced” reports Marcus Steiner.

Moreover he enumerates further advantages of the central material handling: so far we had to service twelve single dryers separately, now we only have this effort for one dry air generator, what is also reducing the number of sources for errors. To that effect also the risk for material contamination is greatly reduced when the material loading is taking place in the central drying area. With that also a significantly decreased dust concentration in the production hall is achieved and material residues on the plant floor are avoided. “The effort spend by our employees has been significantly reduced. With that expanding our production capacity has become much simpler” reports Marcus Steiner with pleasure.

Air compressor delivers thermal energy for the heating of the dry air

The central air dryer is chosen from Labotek´s DFD-Series and supplies up t0 450 m³/h of dry air for in total ten drying hoppers, eight with 100 l and two with 150 l volume. Marcus Steiner is highly appreciating the gravimetric drying control of the “Gravi-Dryer”-technology: Instead of a volumetric level control, that is giving different fill weights depending on the bulk density of the material, the system is equipped with weigh cells. This ensures that the material level in the drying hopper is regulated based on the effective throughput to maintain the preset drying time. This is contributing to the quality of the drying process as well as it is saving energy. ”Even though we are entering shot weight and cycle time (as start point), the system is so intelligent to adapt if the machines are running faster or slower to adapt to increasing or decreasing material usage of the machines connected). This is also of advantage in the dimensioning of the hopper size – we did not have to select the hopper size so stringently according to expected throughput. We have been able to choose the hoppers a little larger than actually needed and we just do not fill them to the top (unless this is required).”

With the energy efficiency in mind, Marcus Steiner finds further relevant aspects to the system: The dry air generator is frequency regulated to provide only the air flow actually required. Furthermore the process air towards the drying hoppers is heated up via a heat exchanger from the cooling of the compressed air unit, that is providing hot water at a temperature of consistently 70°C. Labotek is selling this concept as Labotek EHR (external heat recovery) and is citing energy savings of up to 85%.

Additional material dedicated conveying line for delicate material

The dried resin is conveyed through newly installed material pipes and a manual coupling station to the production hall. For this twelve machine dedicated material lines are run from the coupling station to the processing machines. In addition to this a so called material ring line was installed to supply only one material type for all machines. “We have installed this material ring line to supply the most delicate material with the highest demand for purity safely, with no contamination to the machines, which is also the material used most.

Each machine is equipped with 5 liter insulated material hoppers, these are installed with the vacuum receivers, protecting the material against ambient influences and ensuring that ambient moisture stays out. For inline recycling of regrind the material receivers are equipped with integrated dosing valves, that are adding virgin material and regrind controlled by the central control. “There are some applications where sprues are ground in beside-the-press granulators. With this setup we are able to return the regrind in a closed loop directly back into the process.”

Comfort (Ease of use), Safety, Energy savings

All components of the central material handling system are controlled by the central Labo-Net control. The fully automatic regulation and control of the drying and conveying processes encompasses a visualization of the system, overdrying protection and energy savings by the Labotek Energy Savings System (LESS), frequency regulated vacuum stations, adaptive air flow regulation individually for each drying hopper (AFRS) and an SQL-Database.

“The control allows to store and preset drying parameters as recipe centrally. I can set up access levels to allow only authorized personnel to change the parameters. The control will only allow conveying of material to the machine, if the drying quality needed is reached. All process- and drying parameters are documented, alarms are stored and the system is able to record the energy consumption. With that a comprehensive traceability is ensured.”

Ultra Reflex has connected the system to a secured modem to enable the remote service option. The Labotek service can access the system via secured VPN connection if needed. “So far this has happened only once or twice, shortly after the setup of the system” reports Marcus Steiner. “Before we made the decision for the investment we have compared the cost of the central system vs. the cost of the single dryer. Our calculation shows that the system will be amortized within eight years. In this regard the energy savings was an important aspect. Compared to the single units we can now dry the material using significantly less Energy. Furthermore there is less effort for our employees to operate the system. The material is automatically conveyed from the storage to the dryers and from there to the machines. This results in less spillage of material and a cleaner production with less impurities” is Marcus Steiners conclusion.

www.ultra-reflex.de
www.labotek.com

Ultra-Reflex-CEO Mr Marcus Steiner: „The Labo-Net control offers excellent tracebility“
Foto: Labotek

The Injection molder produces mainly optical resins, which must be dried thoroughly and conveyed with closed loop conveying to the process machinery.
Foto: Labotek

Central DFD dry air drier and 10 drying hoppers operates the entire moulding facility with significantly reduction in the energy consumption, compared to the previous individual driers.
Foto: Labotek

12 individual material lines from coupling station to 12 molding machines
As well as the common material ring line for special material.
Foto: Labotek