



FOUNDRY INSIGHT

Improving Performance in Production

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INTEGRATED SYSTEMS FOR MELTING LIGHT GAUGE ALUMINIUM SCRAP



IMS BOOSTS PERFORMANCE AND METAL RECOVERY RATES

The Integrated Melting System (IMS) from Pyrotek, features equipment specially engineered to process aluminium machining chips and convert them back into usable metal. Designed specifically for foundries, the IMS can be used by any facility generating chips from machining operations.

In recent years, key market trends for melting systems have been spurred by a global boom in aluminium recycling, higher commodity and energy prices and also the need for increased cost savings. The current move is towards in-house recycling and away from incurring toll processing charges. Amongst its metal treatment portfolio, Pyrotek supplies its IMS system dedicated to this specific application.

Systems are custom-designed to specific customer requirements: consider the material to be processed, the desired end product, contamination level, type of cutting fluid, required throughput rate and any existing equipment. A unique feature of the IMS is its energy efficiency: it uses waste heat from other thermal processes, such as the melting furnace, to significantly increase the thermal efficiency of the complete operation.

Systems are available with capacities up to 6 mt/hr. Basic equipment featured comprises: a hopper/conveyor; a Jet Bed Dryer; an integrated control panel and a pump and Low Turbulence Scrap Submergence (LOTUSS™) system, all combined with the customer's melting furnace. Further system options available from Pyrotek include: a centrifuge (for liquid reclamation); a screener for shredder fines; a gate filter; a transfer pump and pollution-abatement systems.

PROCESS STAGES

Typical initial feedstock material comprises aluminium machining, sawing or scalper chips, turnings and borings. Shredded scrap is typically oil / water coated with a density between 300–795 kg/m³ (18.7–49.6 lb/ft³). To obtain optimum results in melting, non-metallics and contaminants such as residual volatile organic compounds (VOCs) must be removed, along with any water or oil, to less than 0.2%. For this stage, various methods have been used traditionally,

including crushers, shredders, screeners, thermal dryers and centrifuges.

Using traditional re-melting furnaces, such as rotary and reverberatory equipment for processing contaminated feed, causes uncontrolled combustion and over-temperature scrap melting that can generate additional issues, termed Coating Induced Melt Loss. The general practical rule in the industry is that each 1% contaminant burned off in the molten aluminium creates an additional 1% melt loss. The level of melt loss, and the metal yield realized, is based on scrap thickness, furnace type and the charging method.

Addressing these considerations, the high velocity Jet Bed Dryer from Pyrotek incorporated in the IMS, improves recovery rates, removing moisture and organics to deliver improved performance, productivity and energy savings. Environmental benefits are also obtained since the drying system evaporates moisture and chemically decomposes any water-soluble oils to obtain optimum process yield.

Practical trials have shown that proper scrap treatment in the IMS with a Jet Bed Dryer delivers advantages over open flame methods, which lead to melt loss issues.

Following pre-treatment, the dry, screened scrap chips exit the dryer system directly into the patented LOTUSS or hybrid charge well for melting, delivering excellent rates of metal recovery.

CUSTOMER BENEFITS HIGHLIGHTED

Actual production results from a customer's operation illustrate the issue of coating-induced melt loss and the benefits derived from using the IMS.

In the traditional method, shredded scrap containing 2.3% oil residue is charged directly into the customer's furnace side well and the coating is burned off in the aluminium bath. Manual submergence is carried out using a skim tool.

Using this process route, the customer reports an 89% metal

yield. But, with the Pyrotek IMS System, pre-cleaning is carried out effectively with a Jet Bed Dryer and the resultant scrap is submerged below the molten metal level by charging directly into the LOTUSS vortex. This achieved a 95% metal yield, showing that the Pyrotek technology clearly improves process performance and reduces coating-induced melt loss.

Pyrotek offers a unique additional service to potential customers of the IMS, whereby samples of the customer's scrap chips can be tested to assess potential process recovery rates and environmental exhaust treatment demonstrations in our own dedicated in-house test facility.

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JET BED DRYER

The Jet Bed Dryer has been designed specifically for this application. The equipment works by passing process air directly through a bed of chips via a perforated plate. A vibration function assists the mixing and transfer of the material in an inline process, taking approximately 3 minutes for the wet chips to travel through the dryer. The system delivers a range of process advantages for customers.

- Chips are "steam cleaned" of all organics and dust with high velocity air jets, resulting in the highest possible recovery rate and metal quality.
- Due to the high volume of air throughput, drying is achieved in an inert environment, therefore preventing combustion or oxidation of VOCs.
- There is no baked-on residue present on the final product as often seen with conventional dryers, which eliminates a potential source of melt loss.
- Heat is retained in the chips, resulting in a 25% increase of energy efficiency in the melting process.
- The system requires no significant mechanical maintenance or rotating equipment to repair.
- The low operating temperature does not oxidize the scrap chips so that maximum metal recovery can be obtained.



LOTUSS™ REMELT SYSTEM

LOTUSS is one of the leading technologies for melting light gauge scrap. It provides instant wetting and rapid submergence of the scrap charge to deliver improved performance and productivity in metal recovery, without using expensive, hard-to-maintain mechanical charging or submerging equipment.

Growth of the oxide skin is minimized by reducing the exposure to hot air and by its method of melting. Additionally, a shear force is provided to break up the existing oxide skin at the moment the scrap melts.

The application of LOTUSS integrated in the IMS system offers a range of benefits, including the following:

- High metal recovery rates
- Maximized metal production
- Designed for continuous, automated operation
- Low operating cost
- Low capital investment
- Low maintenance
- Easy installation
- Can be retrofitted to existing furnaces

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