



Exclusive White Paper

Vibratory Feeders for Scrap Recycling



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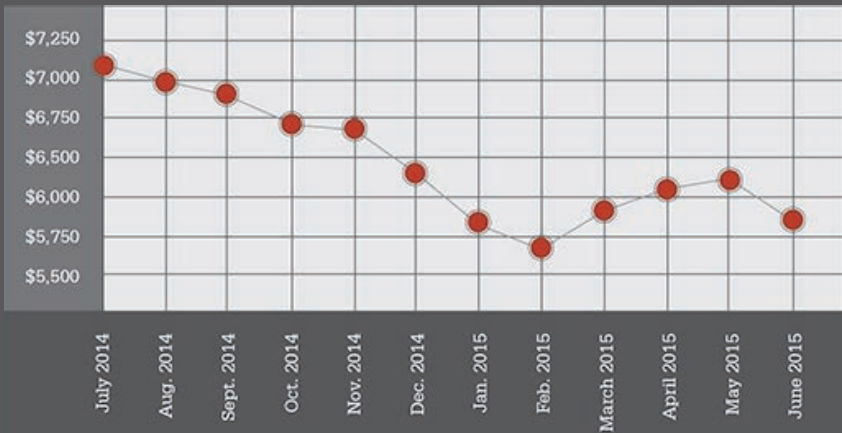
Nonferrous Scrap

Introduction

“Lack of Demand and Too Much Supply” in the nonferrous scrap industry. It has been a recurring headline over the last several years as demand has continued to stay flat. Combine this fact with shrinking margins and scrap processors are looking for any advantage they can get to maximize their investment.

Advances in sorting technology have made identifying materials better than ever before. In terms of purity, what was acceptable in the past is no longer adequate. So what if the purity of your material could be further improved by simply changing the vibratory feeder in front of your sorter technology?

That’s what we set out to determine - does a General Kinematics (GK) High Stroke Feeder (HSF) improve material purity levels? Intuitively it makes sense that the more energy and disruption you put into the material up front, the better the separation, thus resulting in improved purity.



Copper - LME Pricing

For years, vibratory feeders have been used in front of all types of sorting technologies in the scrap industry. The purpose of the vibratory feeders is to put energy into the Auto Shred Residue (ASR) and cause a slight separation of the various materials (fluff from metal, metal from wires, wires from other wires). This slight separation then becomes greatly increased when the material is transferred to the much faster moving sorting belt conveyor, typically operating at ~500 FPM (2.5 m/s). In addition, the vibratory action promotes material to spread across the full width of the pan, thinning out the burden depth and making the sorting device more effective. The slight separation and increased spread provided by a vibratory feeder results in an improvement in the purity of the target commodity.

Without the dynamic effects that the vibratory feeder provides, material traveling on a belt conveyor directly to the sorter belt does not receive the added energy input and remains commingled as it gets transferred.



GK HSF & Optical Sorter

Vibratory Feeders

There are two type of drive systems on vibratory feeders; direct force, and indirect force. Direct force feeders are a simple design and provide moderate performance over varying material loadings. These units can be easily identified by the dual motors mounted directly to the feeder pan, either below the pan or off the sides. Typically these operate with a maximum displacement of 7/16" (11mm) on the pan to vibrate the ASR. Inherent to the design of direct force drives, as the material load increases, the displacement decreases causing less energy to be imparted to the ASR. As discussed above, the purpose of the feeder is to maximize the energy input to the ASR.



GK's Two-Mass Design

Indirect force (aka two-mass, natural frequency) feeders can generally be identified by a single (typically just one, can be two on larger feeders) vibratory motor assembly connected to reactor springs which are connected to the vibrating pan. GK's HSF are indirect drive feeders with specific engineering to operate with a displacement of 5/8" (16mm) or greater. This number may not appear to be much of a difference, but a stroke increase of more than 150% is achieved with the HSF than with direct drive feeders. In the vibratory world, every 1/16" has a significant impact on the amount of energy being developed and directly transmitted to the ASR

Another benefit of the indirect drive is a dynamic response to surge loads. Since this drive uses reactor springs to transmit the force, it dynamically changes the displacement based on the material loading. Consequently, as the loading increases so does the displacement resulting in more energy into the ASR. Thereby separation is increased, spread is better across the width of the trough, and travel rate is improved.



GK Feeder

STEINERT

ASR Input Material

The Challenge

As customers kept challenging us to push the physical limits of our vibratory feeders, we visually field tested and proved these facts for years. The challenge now was to quantify this fact.

We contacted a leading manufacturer of optical sorting technology for input. After considering our claims, they agreed to run a test in their R&D center to compare a direct drive feeder vs. GK's HSF.

The test was set up on an induction sorter to detect all metals in the sample ASR. They ran several tests at varying feed rates and compared the results.

The lab results proved that GK's HSF did in fact increase purity of the final product. Across varying feed rates, the overall average was 5.3% improvement in the purity. Putting this in terms of production value, running 10 TPH ASR with 3% metal, assuming a \$0.01/lbs in increased revenue based on purity, correlates to \$12,480/year.

*Purer material means increased negotiating power.
Consider a difference of as little as \$0.01 or even just \$0.05 more:*

| TPH | Metal | Lbs/hour | \$/lbs | \$/hour | hours/week | weeks/year | \$/year |
|-----|-------|----------|---------|----------|------------|------------|-------------|
| 10 | 3% | 600 | \$ 0.01 | \$ 6.00 | 40 | 52 | \$12,480.00 |
| 10 | 3% | 600 | \$ 0.05 | \$ 30.00 | 40 | 52 | \$62,400.00 |

*Based on market demand.

Increased Recovery Values

Final Results

So why should a seemingly simple vibratory feeder require more consideration in your processing line?

- The physics behind direct force vs. indirect force are undeniable. By using the higher stroke capabilities of the GK's HSF Two-Mass feeder, your ASR material is better distributed, has better separation for enhanced presentation to the optical sorter.
- Lab results prove that the overall purity improvements was at 5.3%. Better purity means better optical sorting results.
- By increasing purity levels, your ASR revenues will increase dramatically. Consider that just a \$0.01/pound advantage means an additional \$12,480 in revenue every year.

By pairing up a high performance optical sorter with a high performance High Stroke Feeder from General Kinematics, you will improve your purity and your profits.

Worldwide Support

Established in 1960, General Kinematics Corporation is headquartered in Crystal Lake, IL. With offices around the world, GK is the global leader in vibratory technology solutions for the foundry, recycling, mining and bulk processing industries. The company manufactures a complete line of vibratory equipment and solutions designed to effectively move, separate and recover a wide variety of materials. Solving customers toughest process challenges and focused on customer service, General Kinematics is renowned for superior technical knowledge as well as engineering and manufacturing equipment of the highest quality and durability.



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