

LUDMAN MACHINE CO

# WHITE PAPER

ZERO WASTE STREAMS CREATE NEW OPPORTUNITIES FOR EXISTING PRODUCTS





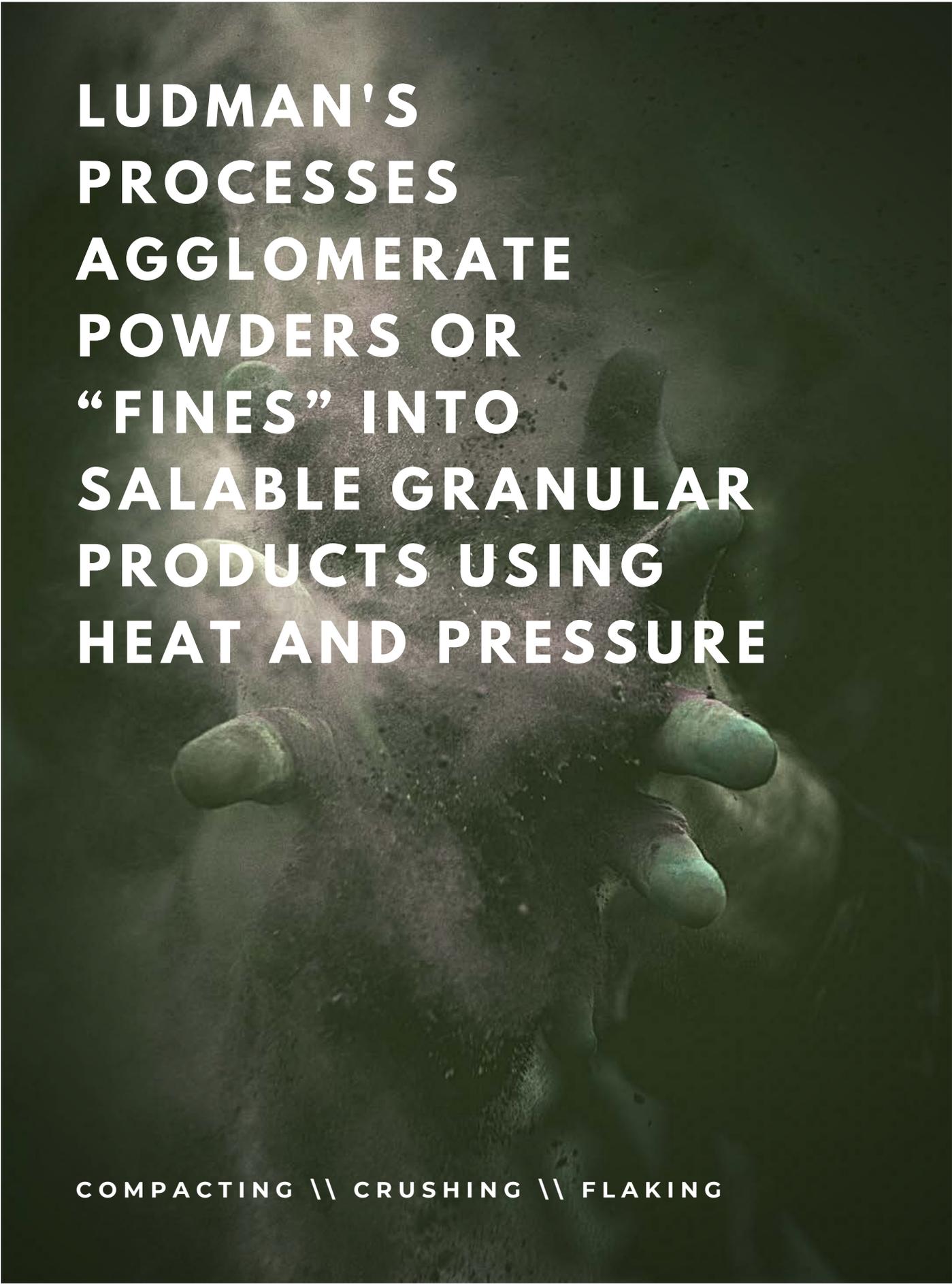
## FROM TRASH TO CASH

Creating commercially viable products

New environmental regulations combined with an emphasis to improve profitability and decrease costs have driven manufacturers to look for ways to dramatically decrease waste streams. This trend has forced manufacturing and environmental engineers to find new, innovative alternatives to land-filling industrial by-products-and in many cases, these solutions are turning what was once considered waste, into commercially viable products.

One of the key ingredients to this transformation of trash to cash is Ludman

Machine, from Muskego, Wisconsin and their line of compactors, granulators and flaking mills. Compactors, which are widely used in the mining and chemical industries, can agglomerate powders or “fines” into salable granular products using heat and pressure. The granulators and flaking mills can then shape and size the agglomerated solid. To understand just how these machines fit in the manufacturing mix, Ludman president, R. W. Wendelburg described the potash manufacturing process.



**LUDMAN'S  
PROCESSES  
AGGLOMERATE  
POWDERS OR  
“FINES” INTO  
SALABLE GRANULAR  
PRODUCTS USING  
HEAT AND PRESSURE**

**COMPACTING \\ CRUSHING \\ FLAKING**

# POTASH AND SALT

Two minerals that go hand in hand

He started by describing how potash is mined, and how the potash, which contains large amounts of salt has to be purified. “To purify the potash, it has to be pulverized so that the salt and minerals can be removed. Once the impurities are removed, the powdered potash has to be agglomerated into a solid ribbon that can be processed or granulated to a specific size or shape.”

He went on to add that some salts are granulated while others are flaked. “Food manufacturers want flaked salt for pretzels and other snack foods so that the salt bakes right in and doesn’t fall to the bottom of the bag. Road salt, on the other hand, needs to have a generally uniform shape and size, but uniformity and consistency are not as critical for road salt as it is to table salt.



## TO PURIFY THE POTASH, IT HAS TO BE PULVERIZED SO THAT THE SALT AND MINERALS CAN BE REMOVED

Richard Horsfield, Ludman’s Sales Manager went on to talk about other industrial and environmental applications where compactors are used. One example was the utility or power generation industry. Mr. Horsfield explained that one of the by-products of flue gas de-sulfurization (the technology used to remove sulfur dioxide from utility stack emissions) is gypsum. “This gypsum, according to industry experts is purer, more consistent and less expensive to mine than natural gypsum rock,” said Mr. Horsfield.

He went on to say that until recently, it was difficult to get the damp gypsum from the power plant to the factory. “They could get the gypsum into a standard tank car, but it was real tough to get out,” he said. Engineers found, however that with one of Ludman’s compactors, the gypsum could be sized into discrete pieces which flow easily out of the tank cars

The trend, according to Wendelburg, is that companies are taking a more productive approach toward their wastestreams.



## **MINING AND PROCESSING**

Minerals, chemicals and fertilizers

If a manufacturing process generates potassium, for example, the company has probably stopped looking for landfill sites and has found a way to agglomerate and recycle the fines. If they can sell it - all the better. We can make it easy for these companies by agglomerating the fines and precision grinding or cracking the newly formed solid with minimum fines. These types of application according to Wendelburg are becoming more and more common place. Yet, the mainstay of our product is in the mining and processing of chemicals such as Potash (potassium chloride), Ammonium Sulfate, Potassium

Nitrate, and others that are used primarily in the fertilizer industry.

Feeding the ever growing world population now and for the future is of great concern. One of the answers to this concern is Balanced Fertilizers. Compacted and granulated products can be blended, shipped and release can be controlled. The net results of this product, coming off our mills is fertilizers that will produce a considerably higher crop yield per field than raw or natural fertilizers.

# ABOUT COMPACTORS

Roll presses for agglomeration

The typical compactor consists of a gravity or force feed system which sits on top of two pre-loaded rollers which are rotating in opposite directions. On a large compactor, each roller weighs upwards of 22,000 lbs and can exert up to 1.6 million lbs. of pressure. The rollers, which are hydraulically controlled, can maintain product thickness

Large machines, when operating at capacity, can process 120 tons per hour while producing a cake of material  $\frac{3}{4}$ " thick. At the heart of the compactor is a set of spherical roller bearings which can have a bore diameter of 500 mm. These bearings are used because they withstand high radial loads and up to two degrees of misalignment.



## LARGE MACHINES, WHEN OPERATING AT CAPACITY, CAN PROCESS 120 TONS PER HOUR

According to Gil Detweiller, the applications engineer who has been working with Ludman Machine over the years, the bearings for this application were selected very carefully, "There is a tremendous amount of pressure on the bearings the whole time this machine is running. And to make matters worse, the feed mechanism can load one side of the rollers more than another, which can lead to a misalignment conditions - a particularly unfavorable condition for any bearing," he said.

According to Detweiller, the bearings on these machines are more prone to contamination failures than shock load or fatigue failures. The bearings are working within a very difficult environment. In most cases the raw material is a fine powder - which completely covers a new machine in hours. Eventually that fine dust or powder creeps into the bearing cavity to contaminate the lubricant and eventually cause premature bearing failure. To combat this, Ludman engineers developed a fairly sophisticated oil lubrication and filtration system.



# A WAY TO REDUCE MAINTENANCE AND DOWNTIME COSTS

## **PREVENTIVE MAINTENANCE**

Fixes to common sources of failure

Because bearing and seal failures are the most common causes of downtime, the Ludman Staff has been working with SKF engineers to create a way to reduce maintenance and downtime costs while improving the chances that the bearing will be installed properly. “We went from the tapered shaft to a straight shaft with a tapered withdrawal sleeve,” said Richard Horsfield. When you have one of these machines out in the boondocks you just don’t send a 22,000 lbs. shaft to the corner machine shop. In addition, if the shop doesn’t get the taper absolutely perfect, a whole host of other problems start to develop.”

Richard went on to add that when they switched to a tapered withdrawal sleeve, complaints of premature bearing failure have virtually disappeared. Now, if the bearing tears anything up it’s the withdrawal sleeve and not the shaft. “In addition, we’ve been telling our customer about the hydraulic nut from SKF. In the shop we’ve found that the hydraulic nut can get the bearing in place faster, easier and more accurately than ever before.” He added that when they started to use the hydraulic nut to install bearings in the shop, it reduced installation time significantly. Now, we recommend the hydraulic nut to all our customers.”