

# Agglomeration Processes: Phenomena, Technologies, Equipment

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## Agglomeration Technologies of Processing Powder Wastes

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**Abstract.** This article deals with the presentation of modern applications for processing powdered, primarily hazardous, waste to an agglomeration form appropriate for subsequent processing by classical methods, for example in the construction, automotive and consumer goods industries. The aim of the research work was to set appropriate operating conditions in order to appreciate currently non-processable wastes resulting from the intensive production of often extremely expensive materials. Technologies which enable returning powder waste back into the primary production cycle were developed and experimentally tested, thus saving raw material resources. When necessary for the fixing of fine airborne particles with a problematic compacting curve (hard to compress, repulsive due to the surface charge) extrusion processes using a patented technology enabling controlled modification of shear forces in the extrusion zone were successfully applied. A new type of axial extruder allows the elimination of the liquid phase and as a result prevents the clogging of the extrusion chamber. In the case of need for granulation of sensitive materials (for example pharmaceuticals not allowing the addition of any kind of agglomerating fluid or reacting strongly in the contact of the two phases), a process of compaction between rolls with different profiled surface was successfully applied. The developed high technologies and the resulting products thus represent a major contribution to environmental protection in the context of not only the work but also the communal environment.

### Introduction

Illustrative application of the assessment of the suitability of agglomeration technologies for processing completely dry, thin and powdery municipal waste which burdens public and work environments is the elimination of dust from the grinding of brake linings for cars. The aim was to process waste now going to landfills into a form for effective return to the production process or for material or energy recycling. Preliminary tests have shown that repeatedly compressed materials have a "memory" of the history of previous compression and accordingly returning them to primary production is not meaningful. The inhomogeneities that formed during manufacturing affected the final quality of the product. Therefore, work was focused on using the least expensive waste transformation technology to create forms allowing handling and further processing. This implies that the agglomerates must have suitable strength for handling, and a particle size greater than 10 µm to enable the using of classical material feeders. Two technologies were taken into consideration: dry compaction, possibly with a small addition of an agglomerating binder, or classical extrusion of paste material with a large amount of the added binder agglomerate. The material could not be mixed with plain water, and therefore a wetting binder had to be added. To ensure the strength of the agglomerates after drying, it was suitable to apply a bonding agent which would not be a problem for further processing. Water glass is such a binder, but so as to not increase processing costs, only the most necessary minimal concentration.

### Compaction processing of powder from manufacture of brake lining

One of the investigated processes of technological processing of powder is roll press compaction. Compaction is a continuous technology process in the course of which the upstream

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