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## Practical and Economical Advantages of New Grinding Technology

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The main feature of the new ECM grinding technology is the way energy is transferred to the grinding media. While all classical media mills use discs, rotors or pins to transfer the energy by friction, ECM **accelerators** create an intense hydraulic flow of beads and product. This unique principle allows for high, dense energy input with optimum distribution throughout the entire grinding chamber. The stability of bead flow is such that a wide range of product viscosities can be processed at high flow rates without affecting the distribution of the media in an axial direction of the grinding chamber, which would create media packing. Contrary to other mills, product passes through each single high energy ECM accelerator before it can move to the next one. This results in very short residence times and very narrow particle size distributions with tails eliminated.

These unique features allow the ECM to work with equal efficiencies in single pass or circulation milling, and with high or low product viscosities.

During the past months, we have had the opportunity to compare an ECM Poly to other bead mills under real production conditions by major coatings manufacturers of the Czech and Slovak Republics. This paper is based on the results of those trials. It is our intention to demonstrate objectively the practical and economical advantages of the ECM technology.

We will not only compare the production capacity but also the main components of effective production costs, like capital investment, operating labor, energy usage, cleaning, maintenance etc.

## 1) Production capacity

The following tables show comparative examples of extensive trials. The numbers are self-explanatory. Additionally, the production capacities need no further explanation. Most of the pastes were processed in high concentrations as done on the standard grinding equipment which resulted in higher production capacities as mentioned in these tables. With the ECM, the particle size can also be reduced below the standard, providing in most cases higher color strength and consequently a saving of pigments; the most expensive component of formulations.

### 1.1 ECM Poly versus classical horizontal bead mill.

Product / requirements	ECM Poly 8,2 liter	Horizontal mill 16,5 liter	Horizontal mill 45 liter	Horizontal mill 60 liter	Ratio *
Lacquer concentrate for wood 25 μ	230 kg/h - 35μ 180 kg/h - 25μ 130 kg/h - 20μ Circulation process		115 kg/h - 35μ  Circulation		11:1
Synthetic enamel white < 30 μ	200 kg/h - 30 μ 2 Pass process			200 kg/h - 30 μ 2 Passes	7:1
High concentrate black paste for synthetic enamels 15μ	250 kg/h - 15μ 130 kg/h - 5μ 1 Pass process	70 kg/h - 15μ  2 Passes			7:1

\* Comparative production ratio per liter volume of grinding chambers of ECM Poly versus horizontal mill.

### 1.2 ECM Poly versus vertical bead mill.

Product / requirements	ECM Poly 8,2 liter	Vertical mill 70 liter	Vertical mill 140 liter	Ratio*
Alkyd based paste 50% iron oxide 15 μ	200 kg/h - 10μ 1 Pass	75 kg/h - 15μ 1 Pass	-	20:1
Alkyd based paste 18% green 10 μ	65 kg/h - 8 μ 2 Passes	35 kg/h - 10 μ 2 Passes		16:1
Synthetic enamel black < 30 μ	130 kg/h - 25 μ 2 Passes		170 kg/h - 30μ several passes	13:1
High concentrate black paste for synthetic enamels 15μ	250 kg/h - 15μ 130 kg/h - 5μ 1 Pass process	18 kg/h - 15μ  4 Passes		118:1

\* Comparative production ratio per liter volume of grinding chambers of ECM Poly versus vertical bead mill.

### 1.3 ECM Poly versus basket mill.

Product / requirements	ECM Poly 8,2 liter	Basket mill 30	Basket mill 50
Black Anticorrosion waterborne primer - 15 $\mu$	500 kg/h 1 Pass process		200 kg/h
Brown waterborne latex paint 25-30 $\mu$	990 kg/h 1 Pass process		125 kg/h
Synthetic black top coat < 20 $\mu$	180 kg/h 2 Pass process	100 kg/h	

### 2) Energy consumption and cooling capacity.

The specific energy consumption (kW/kg of produced product) of the ECM is, depending on the product processed, between 30% and 60% of all other milling systems. This demonstrates the high efficiency of the ECM where a high percentage of the consumed energy is efficiently used for actual grinding. Additionally, low energy consumption has a positive influence on the economies of production costs.

Advanced materials of construction (dense ceramic, silicon carbide, for the grinding cylinder), with a small chamber and high efficiency volume throughput in addition to a large cooling surface to chamber volume insures that the ECM will remain below maximum process temperatures during all our trials.

### 3) Cleaning

The mill clean-up process has a great influence on production costs: labor or manpower costs, non-productivity of the equipment, solvent consumption and recycling / disposal costs of the spent solvents. During our tests down time for cleaning the ECM Poly in extreme color changes (black to white) did not exceed 30 minutes. There is no need to open the ECM; therefore no manual cleaning is required. The whole cleaning process is done in a close circuit loop with minimal solvent usage. This means no fugitive emissions and minimal operator exposure to any additional vapor emissions.

Recycling and environmental protection costs have constantly increased over the last decade and it is expected that continued progress toward more stringent environmental regulations may occur. Cleaning costs and environmental emissions are now a growing percentage of

production costs. This issue can no longer be ignored especially for any new equipment investments. ***The most product lost during cleaning of the 8 liter ECM Poly was 3 kg!!***

#### **4) Maintenance**

Based on the known quality and reliability of Dyno-Mills in addition to the newest wear resistant materials, the ECM-Poly experiences modest maintenance costs. The ceramic cylinder, high chrome cast alloy and specialty steels ensure low wear rates of the ECM components. The double mechanical seal is specifically designed for the ECM series of media mills allowing for above average lifetime. Maintenance costs per ton of produced product are lower than any other production machine. Guaranteed availability of spare parts and ease of replacement / servicing allows extremely short maintenance shutdowns.

#### **5) Conclusion**

Cost effectiveness, “just-in-time” production, shortened delivery time requirements, aggressiveness of the competition, unstable markets, reduced margins etc. have become inevitable factors of business life. Employees and process equipment must be more and more flexible to allow for the fastest possible reaction of our companies and to their market demands. As the lifetime of product ranges become shorter and shorter and the number of products with reduced batch sizes increase, production costs are considerably affected by this situation. The time when equipment was dedicated to a single process, or even when processes could be adapted to existing production equipment are over. Only the most efficient productivity, flexibility and shortest down times for cleaning and maintenance purposes can guaranty the indispensable efficiency and high utilization ratio of production equipment. While, only a decade ago, cleaning and maintenance time were viewed as marginal, it now becomes more important and its costs are a growing portion of production and profitability costs. Energy and environmental considerations will continue to increase in the future as well.

As a manufacturer of production equipment, we were subject to the obligation of finding a response to this evolution. The ECM Poly, specially dedicated to the production of paints and pigment paste offers, by its unique and patented working principle, the right answer to these requirements. Because of the ECM’s efficiencies, flexibility, and ease of installation, the initial investment costs are actually lower for the ECM than for conventional mills.

**Why invest in the past when the future is available?**