

## INTRODUCTION

Mineral fillers are generally inert, finely ground minerals that are incorporated into the manufacturing of various products. They reduce the consumption of more expensive raw materials such as plastic resin or rubber. Extenders enhance the final products usefulness by introducing new properties.

The use of finely ground minerals as fillers in manufactured products has developed from an experimental means of saving production cost to a \$3 billion (U.S.) industry in North America alone.

Originally incorporated into products because of their inert behaviour, many different minerals are now being used, thanks to improving technologies, to enhance such properties as strength, flexibility and weight.

At least 15 minerals are considered to be major filler and extender products. These range in annual North American sales of from \$2.3 million (U.S.) for nepheline syenite to \$1.5 billion (U.S.) for the filler/pigment colouring titanium dioxide.

Annual figures for U.S. consumption of filler minerals by C. H. Kline and Associates show some dramatic increases over the years. Excluding the values for titanium dioxide, which is more a colourant than a filler, consumption has increased from \$525 million (U.S.) in 1978 in North America to a forecast of \$3.091 billion (U.S.) in 1991.

Fillers make up a very small percentage of sales by volume of industrial minerals, but a large percentage by dollar reflecting their worth per tonne (Table 1).

Table 1. General price range for high quality\* filler minerals, 1985.

Filler	Median Particle Size Range	Specifications	Estimated Price Range (U.S. dollars)
Alumina hydrate	1.0-2.0 $\mu\text{m}$		600+
	7.0-10.0 $\mu\text{m}$		300-500
Barite	2.0-4.0 $\mu\text{m}$	bleached or natural	200-400
Ground calcium carbonate	1-2 $\mu\text{m}$		150-200
	4-6 $\mu\text{m}$		100
Diatomite	variable		175-750
Kaolin	0.5 $\mu\text{m}$	water washed	200-250
	soft	air floated	55- 90
	-2 $\mu\text{m}$	delaminated	150-300
	1-2 $\mu\text{m}$	calcined	275-500
		surface treated	250-750
Mica	95% passing 325 mesh	wet ground	400-500
	95% passing 325 mesh	dry ground	100-350
Ground silica	2 $\mu\text{m}$		200-350
	6-8 $\mu\text{m}$		75-100
Talc	2-4 $\mu\text{m}$	western	100-400
		eastern	175-250
Titanium dioxide	variable	anatase or rutile	0.80/lb
Wollastonite	95% passing 200 mesh		150-500

\* low chemical impurities, high brightness values and finely ground product; figures after C. H. Kline and Associates, 1986

According to C. H. Kline and Associates' statistics for 1985, consumption of filler and extender minerals in North America was led by the paper industry at 46% of tonnage consumed with the other large consumers being adhesives and sealants, plastics, paint, rubber and carpet backing industries (Fig. 1). Other end uses for some of these industrial minerals include ceramics, animal feed and fertilizers.

Figure 2 shows the minerals that are used as fillers. Kaolin and calcium carbonate, because of their abundance, low cost, low abrasiveness and high brightness values are the two most popular fillers.

Kaolin's major application is as a filler and coater in paper but, like calcium carbonate, is very versatile

and can be used in almost any industry. The calcium carbonate used in the industry is very high quality with few impurities and can be derived from deposits of limestone, dolomite, marble and calcite. Two specification sheets from the Pulverized Limestone Association (PLA) are included in Appendix 1. These state parameters which must be obtained to classify a calcium carbonate product into (a) a very fine ground high calcium limestone, and (b) a -325 mesh high calcium limestone according to their standards. Chemical, particle size and brightness values are some of the more important requirements to be met. Many of the high quality calcium carbonate filler producers are members of the PLA and these sheets can act as an excellent guide when assessing a limestone for its potential in the industry.

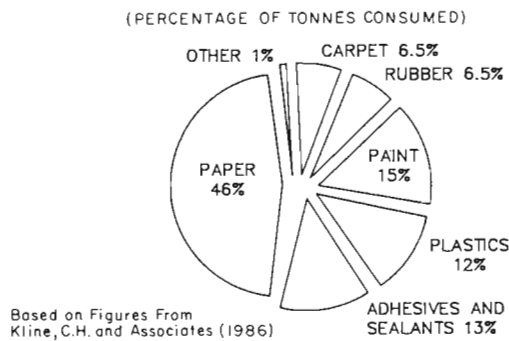


Figure 1. North American consumption of extender and filler minerals by market, 1985

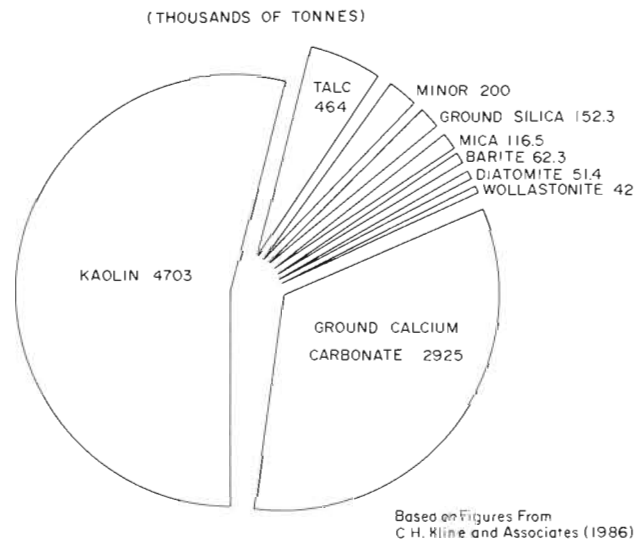


Figure 2. North American consumption of extender and filler minerals by product, 1985