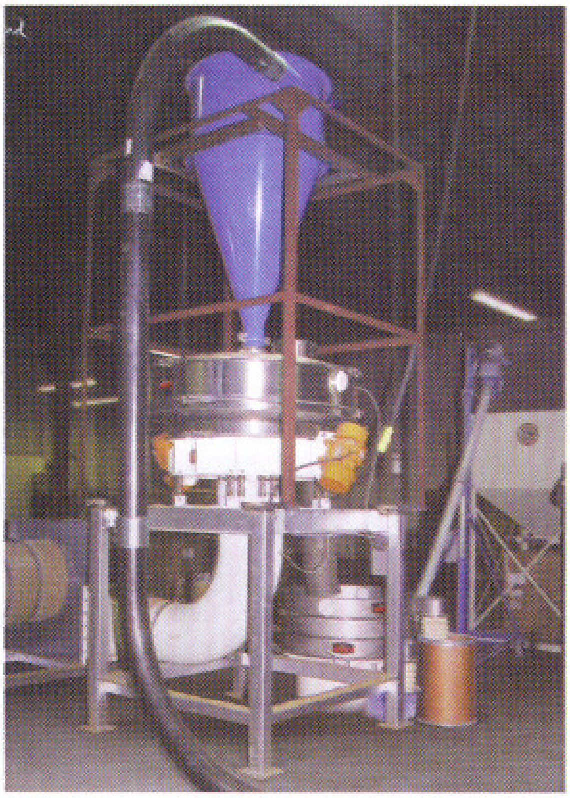
Speed It Up with a Circular Fluidized Bed Cooler

An East Coast toll compounder increased productivity with a circular fluidized bed cooler.

Compounding Engineering Solutions (CES), Clifton, N.J., has found a way to cool and dry most of its plastics more quickly using a circular fluidized bed cooling system. The fluidized bed cooler improves processing time when compounding plastics such as polypropylene and engineering resins like nylons and polyesters.

CES needed a better way to cool and dry plastic pellets when it began processing a plastic composite. The 50 percent cellulose-filled plastic pellets could not be cut or cooled using standard water quenching techniques because moisture would degrade the cellulose. CES' search for a way to cool these pellets led them to a circular fluidized bed cooler from Kason Corp., Millburn, N.J. Now, CES uses the circular fluidized bed cooler along with its traditional underwater immersion cooling for all of the plastics it processes.



Cellulose plastic pellets move from a pelletizer to a cyclone separator via a pneumatic conveyor. They are gravity discharged into a 60" dia. circular vibratory cooler that reduces their temperature to 100°F (38°C) and moisture content to less than 1 percent.

Cooling Moisture-Sensitive Pellets

CES extrudes the moisture-sensitive wood-plastic compound on a 70-mm twin-screw Krupp Werner & Pfleiderer ZSK70 Megacompounder. According to CES CEO Arash Kiani, Ph.D., the twin screw runs at a higher speed than the alternative method of a single screw following a twin-screw compounder, with both running slower to prevent possible ignition or agglomeration of pellets. Reducing to one step also eliminates one piece of equipment and other potential problems.

As the cellulose-plastic compound exits the extruder at 350°F (177°C), a hot-face die cutter pelletizes it into 0.125 to 0.25" sizes. The high heat imparted by the high speed twin screw demands rapid cooling of the pellets. A 30' long, 6" dia. pneumatic conveyor speeds them into a 6' high cyclone, then drops them into the 60" dia. circular vibrating fluidized bed processor. The processor cools the pellets to 100°F (38°C) and dries them to less than 1 percent moisture. The transfer between cutting chamber and cooler takes 2 sec at 4,000 lb/hr.

The free-flowing wood-plastic pellets (bulk density 40 lb/ft^3) discharge from the fluid bed cooler into a 48" dia. Kason Vibroscreen circular vibratory separator. The screener classifies pellets into on-size (0.125 to 0.25"), over-size (larger than 0.25") and fines (smaller than 0.125"). A flexible screw conveyor carries the on-size pellets to a hopper, which drops them into a gaylord for shipment and subsequent extrusion or injection molding for customers who make products such as fence posts, decking and siding. The overs and fines are recycled back into the process.

How the Circular Vibratory Cooler Operates

A 10 hp blower on the circular fluidized bed cooler introduces 4,000 cfm of air through a pipe via the bottom inlet of the fluid bed chamber to cool the pellets on a circular fluidization medium. Two eccentric weight motors and spring suspension vibrate the unit that, together with the continuous airflow, separates and fluidizes individual pellets. This maximizes the material's surface area to speed the drying and cooling processes. The processor's vibratory motion conveys the material along a defined pathway for uniform processing on a first-in/first-out (FIFO) basis.

The circular fluid bed processor is compact, which allows it to fit on a caster-mounted skid with blower, hopper and controls. Such mobility permits CES to move the system where needed to cool and dry pellets at other compounding lines in the plant.

The mobility of its compact circular fluid bed processor permits CES to move the system wherever it is needed.

CES rejected cooling on a long steel belt because of its size, weight and immobility. Fred Burbank, vice president of CES, noted that the circular fluidized bed cools and dries at least four times faster than casting the extruded pellets on a steel belt. A belt would need to stretch 150' to reduce the temperature of the cellulose-plastic pellets by 250°F (121°C). "It would occupy an impractical amount of plant space and be immovable for other jobs here," he said.

Similarly, a rectangular fluidized bed cooler of equivalent capacity would consume about twice the space of the circular fluidized bed unit and be impractical to move for other duties. The circular unit also is inherently stronger than rectangular design, which permits lightweight construction at less cost. Materials can be downgauged; motors and associated components can be downsized, saving costs and energy.

According to CES, cleaning is easier and faster because the circular design has no corners or crevices for material to lodge and cause contamination or hamper cleaning.

Kiani and Burbank selected the circular fluidized bed because they were familiar with the technology from former work in PVC compounding. They found that the Kason unit runs quietly. A rental unit allowed CES to pilot test the process prior to full-scale production.

Burbank said, "The circular fluidized bed works so well, we are using it in most processes." **PCE**

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