

Boosting ethanol production efficiency with step grinding. Doug Kitch, technical sales manager at CPM Industrial Solutions, describes how it is helping producers cut energy costs

Grinding away costs



If you ask most ethanol producers what their biggest costs are, number one would be the cost of their feedstock, and secondly it would be the cost of energy to run their plant.

These energy costs are no small thing. For example, a single 300 hp hammermill operating at 7,500 hours per year might easily rack up a power bill of over \$150,000 (€140,000).

This is why the engineers and product designers at CPM have been working on innovative and cost-effective solutions to help customers reduce those overheads.

A step grinding overview

Step grinding is just what it sounds like – reducing the size of the feedstock in multiple steps, instead of all at once.

In ethanol production, this typically means grinding corn in two or three steps, instead of in a single pass through a hammermill.

Why? There are several benefits to step grinding corn including improved control of particle size reduction, reduced heating and shrink, a reduction in total maintenance costs and greater versatility.

However, the benefit that

customers are the most motivated by are the cost savings that come with improved energy efficiency.

Step grinding equipment choices

Roller mills

In most grinding applications, a roller mill requires less energy to operate than a hammermill.

However, roller mills cannot produce as fine of a particle size as compared to the latter. The increased energy efficiency of the roller mill makes them a compelling choice as a first grinding step in ethanol production and paired with

a hammermill as a second step for finer grinding.

Hammermills

Multiple hammermills in series can also improve efficiency, compared to a single machine. The primary hammermill can use a larger screen, optimised for the initial grind of larger materials. The secondary one can then be optimised for further size reduction.

The importance of screening

Whatever equipment is used in the first stage of a step grinding process, it is beneficial to add a screener between stages.

Some percentage of material will already be appropriately sized after the initial stage and screening allows this material to bypass the secondary stage, further reducing energy consumption and reducing demand on wear-parts.

Calculating energy savings

Roller mill and hammermill energy savings

Field data has shown an increase in energy efficiency of between 25% and 30% when adding a roller mill to an existing single-stage hammermill process. Depending on the facility, this can reduce the energy consumption from 9.52 hp/tonne/hr to 7.44 hp/tonne/hr. Assuming \$0.10/kwh (€0.09), that is a savings of \$0.155/tonne (€0.015) produced.

At 50 tonnes/hr operating 7,500 hours a year, that is a total savings of \$58,125 (€54,386) on electricity alone.

Multiple hammermill energy savings

In the field, it is fairly typical for a single-stage hammermill requiring 250 hp to be replaced by two hammermills totaling 200 hp. A 50 hp/hr reduction at \$0.10/kwh (€0.09) is a



A CPM Roller Mill

savings of \$3.725 (€3.4) for every hour of operation. Assuming 7,500 annual hours of operation, this could create almost \$28,000 (€26,199) in electrical cost savings per year.

Energy efficiency rebates and credits

Besides direct energy cost savings, several customers who have implemented step grinding have been able to take advantage of significant utility rebates and tax incentives targeted at energy efficiency improvements.

Recently, one customer earned around a \$100,000 (€93,568) utility rebate as a direct result of their energy usage reduction from a step grinding system.

Payback periods

How long will it take for the implementation of a step grinding system to “pay for itself” in an ethanol production facility? The answer to that question will vary depending on that facility’s electric rate, configuration and the availability of rebates and credits.

In January, the average electricity cost paid by industrial users in the United States was 8.10¢ (€0.075) per kWh. However, that varied from a low of 5.5¢ (€0.047) in New Mexico to 37.7¢ (€0.35) in Hawaii. Facilities paying a higher rate for their electricity will see a quicker return on their investment.

Similarly, new greenfield projects can integrate step grinding into their design very efficiently, while some existing facilities might require more costly modifications.

In general, most customers see simple payback periods of two to three years before accounting for rebates or incentives.

Reducing maintenance costs and outages

Field experience also shows that step grinding in ethanol production reduces overall maintenance costs.

Depending on the configuration, a step grinding system can also be temporarily

run as a single-stage system while one machine is undergoing maintenance. This can maintain production during maintenance, and reduce plant downtime.

Finally, innovations like CPM’s exclusive Blue Roll technology can increase the lifespan of a roller mill roll two to five times between recorrugation.

Improving an ethanol plant’s efficiency

If an ethanol production plant

is using a single-stage grinding system, like most customers are, they owe it to their bottom line to consider the benefits of step grinding.

Whenever new customers are ready to take a closer look at those benefits, CPM’s engineers and process experts are just a phone call away. ●

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