



Getting the right mix

Dinova increases the efficiency of its mixers with Eaton variable frequency drives

To minimize the risk of production downtime and to guarantee a quick response in the event of a fault, paint manufacturer Dinova replaced the variable frequency drives in its mixers with an Eaton solution. The compact PowerXL DG1 drive with integrated motor protection relay minimizes fault sources, prevents mechanical resonance from affecting the mixing element and reduces energy loss in the motor by dynamically keeping the voltage/frequency curve at a minimum.

Location:

Königswinter, Germany

Challenge:

Modernization of drive technology of mixers for paint and lacquer production

Solution:

PowerXL DG1 variable frequency drive

Results:

Greater reliability, maximum flexibility in terms of mixing speeds, energy savings

“To be able to easily switch between the required process speeds, we need variable frequency drives with maximum flexibility in terms of speed. The Eaton DG1 fulfills these requirements perfectly.”

Dieter Seibert, Technical Manager at Dinova GmbH

Background

Dinova GmbH & Co. KG is a leading manufacturer of paints, lacquers, plasters and decorative coatings as well as varnishes and special products for commercial users. Every year, 30,000 metric tons of facade paints, emulsions and plasters leave the factory in Königswinter, Germany. The company, which has a 60-year history and has been part of international company Meffert AG since 2000, currently employs over 100 staff.

The most important step in the production process of emulsions and plasters is mixing, which can last up to 1.5 hours, depending on the formulation. Firstly, various liquid components are slowly mixed together. The mixing speed is then increased as the fillers and pigments are added. After this dispersion process, the mixing speed is decreased once more as binders are added to the mixture.

Challenge

“In the production process, the precise control of different speeds for the homogenization and dispersion of paints and plasters is fundamental to product quality,” explains Dieter Seibert, Technical Manager at Dinova. The variable frequency drive used therefore plays a key role, as it regulates mixing speeds. Replacement parts for the older variable frequency drives Dinova used are no longer available. This meant that, in the event of a fault, the company was no longer in a position to take swift reparative action. The inevitable risk of production downtime caused by variable frequency drive failure was of constant concern to the team.

There were two possible solutions for Dinova: either retrofit the existing variable frequency drives or replace them completely. Dinova chose the second option – to replace them with Eaton PowerXL DG1 variable frequency drives.



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Solution

The DG1 is one of the leading drives on the market with regard to efficiency and nominal short-circuit current, setting itself apart with functions that go above and beyond the call of duty. When used in the mixer motor, the functionality of the electronic motor potentiometer, for example, comes into its own. It allows the motor speed to be controlled using the 'faster' and 'slower' buttons. The 'skip frequency' function prevents mechanical resonance from affecting the mixing element when the vat is empty. This vibration would otherwise cause bearing damage on the motor and, in the worst-case scenario, cause the mixing element to break. To prevent this, the operator can set the variable frequency drive's critical frequency range. The drive then does not operate at this range. Instead, as it accelerates, the DG1 stays in the lower stopband until the target value is higher than the upper stopband. When slowing down from speeds above the upper stopband, it remains at the upper stopband until the target value is lower than the lower stopband.

In addition, the DG1 fulfills Dinova's requirements in terms of providing maximum flexibility with regard to speed, making it easy to switch between the different speeds required for the various process steps. The dissolver, for example, reaches a maximum speed of 22 m/s. The DG1 can also deal with the wide range of viscosities of the different products. Depending on a material's viscosity, the operator selects a corresponding starting frequency at which the variable frequency drive starts and begins to accelerate along an acceleration ramp.

An intuitive input screen, the startup wizard, and inControl software for the PC make the DG1 easy to use. There are four application settings, a diagnosis function, as well as local/remote switching via a keyboard or digital input. A control panel with a copy/paste function is also available to operators.

The DG1 integrates the mains filter, DC choke and electronic motor protection relay internally. Reduced peripheral component count, which would normally be housed in the switching cabinet, makes for a compact and comparatively cost-effective solution.

Unlike the 3% mains circuit chokes used in comparable products, the 5% DC choke prevents a voltage drop from affecting the drive. It also reduces harmonics more effectively and protects the drive from transients, like a mains choke, using input voltage surge protection. The two-coil version also prevents earth fault currents.

The external motor protection relay is replaced by an internal electronic simulation that calculates the motor's thermal load constantly. In the event of an overload, the DG1 automatically goes into fault mode, protecting the motor from overloading. How it reacts to which fault is configurable. For example, depending on the motor temperature, it can initially just issue a warning and finish the process to minimize material losses, before it switches off the drive. As the motor protection relay is integrated into the variable frequency drive, clamping units are not required, thereby eliminating potential fault sources.

To minimize energy loss in the motor, the 'Active Energy Control' function ensures that the motor efficiency is increased by dynamically adapting the voltage/frequency curve. The 'Onboard Energy Savings Calculator' function allows daily, weekly, monthly and yearly energy consumption data to be recorded, as standard. Using the new variable frequency drive also has another advantage: by fine-tuning the frequency or switching frequency used, motor noises from pulse width modulation can be minimized – without the use of an additional motor choke or sine filter. The DG1, which is installed in a climate-controlled control room, thus ensures a less noisy working environment in the vicinity of the mixer. Eaton After Sales Service provided comprehensive support to Dinova both in the selection and commissioning of the variable frequency drives.

Results

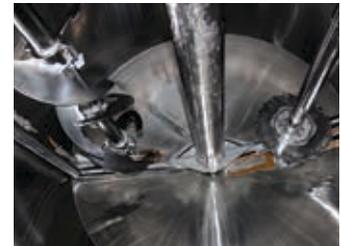
In its mixers, Dinova uses both the size 5 DG1, with a maximum output of 90 kW, and the size 6 variant, with a maximum output of 160 kW. For this application, the drives did not require modification – the standard parameters proved to be more than sufficient. Primarily thanks to the 'Active Energy Control' function, each variable frequency drive saves 2–10% more energy compared to equivalent products right out of the box, without additional motor tuning.



The PowerXL DG1 variable frequency drive is a market leader in terms of efficiency and nominal short-circuit current (Source: Eaton)



One of Dinova's mixers driven by Eaton technology has a capacity of 10,000 (Source: Dinova)



In the mixing vat: The Eaton variable frequency drive controls the speed of the dissolver (right), which breaks up the solid particles in the primary product. The mixer (left) and scraper (middle) slowly move with it (Source: Dinova)

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