



CORRUGATED CARDBOARD

A Sticky Business



PROVEN QUALITY. LEADING TECHNOLOGY.

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1

WHAT IS THE ROLE OF A GLUE PUMP IN CORRUGATED CARDBOARD MANUFACTURING?

Without pumps, the corrugated cardboard industry would grind to a halt. Pumps are necessary as they transfer the glue throughout the production process.

Pumps are a necessity in the cardboard manufacturing process as they transfer the glue to the single facer and the glue machine.

The glue itself is prepared in the glue kitchen where it is collected in the buffer tank. From there, a pump is needed to move the glue from the main storage bucket into separate storage buckets beside the single or double facer glue pans.

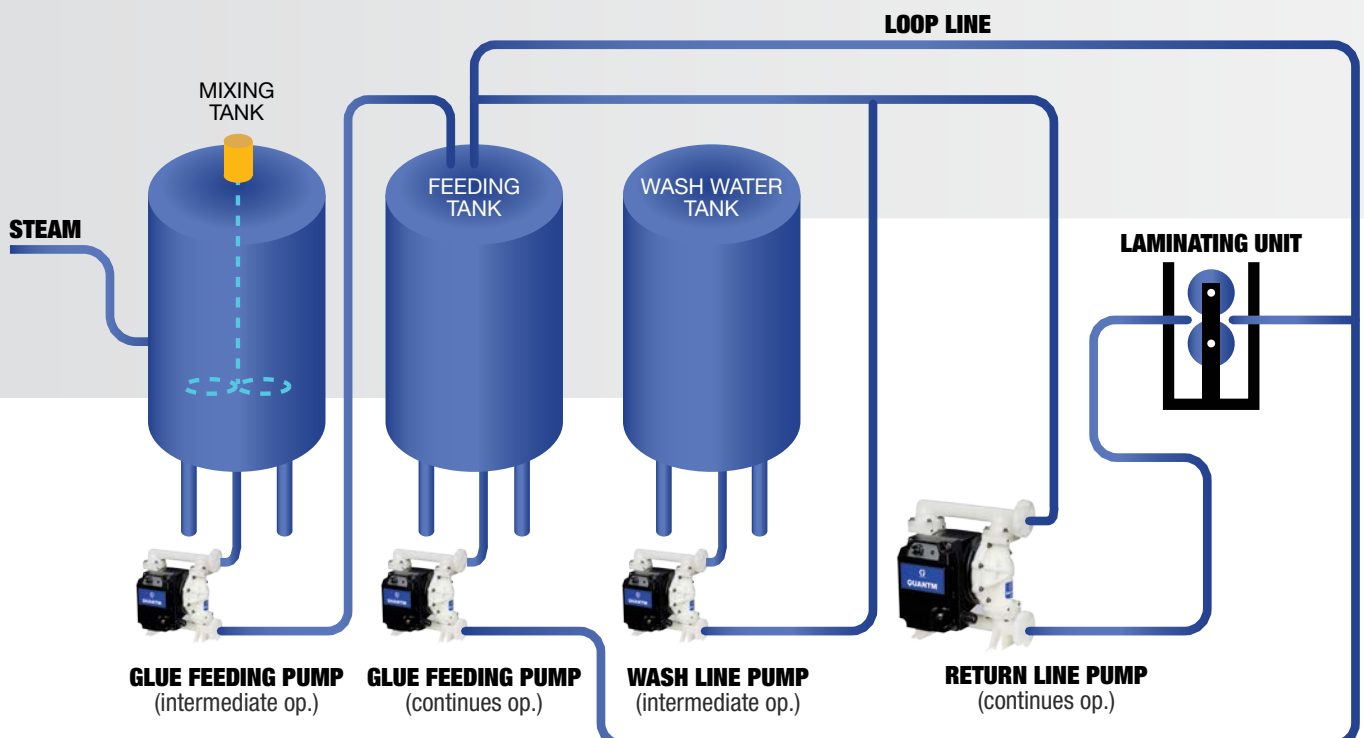
The glue roll picks up the glue and transfers it to the medium tips, while the metering roll keeps a constant glue layer thickness on the glue roll in order for the glue roll to deposit a constant volume of glue on each medium tip.

To prevent the glue from settling in the glue pans, it's constantly circulated from and towards the buffer tank. Here, another, smaller pump is needed, to transfer the glue from the glue pans back into the buffer tank.

Any remaining glue flows into a tray under the machine. A third pump is installed here, to move this remaining glue in the tray into a storage bucket, from where it can be recycled and reused.

After shutdown, all glue in the corrugated line units is pumped into the main storage bucket for use the next working day.

Conclusion: for every corrugated cardboard manufacturing machine in operation, at least three pumps are necessary.



FEATURES TO LOOK FOR IN A GLUE PUMP FOR THE CORRUGATED CARDBOARD INDUSTRY

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Glue isn't the easiest fluid to pump. However, you can pump it efficiently as long as you understand some basic properties of glue:



ABRASIVENESS

Some glues contain ingredients that include small particles. These particles can rub against the pump's internal components and cause abrasion.



CORROSIVENESS

A chemical reaction can occur between certain glues and the pump's materials of construction and cause corrosion inside the pump.



SHEAR SENSITIVITY

Many glues are shear-sensitive, meaning that the product may be adversely changed while being pumped due to the shearing nature of the pump's operation. This can affect the performance of the glue.



VISCOSITY

Viscosity is a major factor in choosing the right pump for a glue application. Glues can have a wide range of viscosities. Highly viscous liquids take longer to fill internal pumping areas for maximum performance and efficiency.



TEMPERATURE

Some pumping technologies can heat up glue during operation; electric-operated double-diaphragm pumps do not have this effect. In general, glue temperature should not exceed 45°C otherwise the glue could turn into a gel.



FLOW

A minimum flow of 1 inch and maximum flow of 3 inch is the flow range that pumps should be able to manage.

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WHAT'S THE BEST PUMP TO USE IN A GLUE KITCHEN IN A CORRUGATED CARDBOARD MANUFACTURING PLANT?

DOUBLE-DIAPHRAGM PUMPS ARE THE PREFERRED PUMPS TO USE AS GLUE PUMPS

Glue dries and hardens inside mechanical seals of, for example, gear pumps, which make the latter vulnerable to breakdowns, leading to costly production downtime. Double-diaphragm pumps do not have mechanical seals, can stall under pressure, and can handle solid particles. They come in configurations that can be adapted to the required abrasion resistance and soda concentration, making them very reliable in glue circulating applications. They are also ideal for pumping high-viscosity fluids. Last but not least, the price of spare parts is low.

Typically, although depending on the actual installation in the plant, a 3-inch double-diaphragm pump is used to send the glue from the buffer tank into the various glue-consuming units, such as single facers, double stacks or triple stacks. From here the glue is pumped into a glue pan, where it is ready to be distributed by the glue roll. From there, at each glue pan in every glue unit, a smaller 1-inch or 2-inch double-diaphragm pump is used to pull the glue from the multiple pans back into the buffer tank.

SELECT THE BEST MATERIALS

Stainless steel, cast iron or polypropylene score highly for the pump body in terms of resistance against abrasion and corrosion. The choice depends on the soda concentration and the size of solid particles. For the inner components, choose materials that do not react with the glue. Generally speaking, most heated glues will react with and corrode specific plastics and rubbers, so avoid these materials when configuring a pump. Balls, seat and diaphragm made of Santoprene® is a good overall choice.





SOME TYPICAL CONFIGURATIONS

Common double-diaphragm pump configurations suitable for glue applications in the corrugated cardboard manufacturing industry are:

- 1-inch up to 3-inch inlet size
- Cast iron with Santoprene® inserts
- Polypropylene with Santoprene® inserts
- Stainless steel with Santoprene® inserts

The size depends on the length of the glue circulation line and the number of glue units that need to be fed. As a rule of thumb, for single-wall corrugated cardboard applications, use 1-inch or 2-inch pumps. For double-wall corrugated cardboard applications, use 2-inch or 3-inch pumps.

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WHY CHOOSE AN ELECTRIC-DRIVEN DOUBLE-DIAPHRAGM GLUE PUMP FOR CORRUGATED CARDBOARD MANUFACTURING?

An electric-operated double-diaphragm pump definitely has “clear” advantages over its air-operated equivalent. Let’s have a closer look.

First of all, the use of electric-operated double-diaphragm (EODD) pumps removes the costs of purchasing, running and maintaining an air compressor. This translates into significant cost savings on your operational budget.

The simple design of an EODD pump is another major advantage over other pump technologies. Simplicity of design means easier cleaning, fewer parts, and faster repair, which translate into reduced downtime of your production line. Moreover, an EODD pump can stay in-line during maintenance without the need to remove it.

These pumps also give a good level of control – especially important for metering and batching. And there is no risk of contamination of products due to the absence of hydraulic backing.

An EODD pump’s seal-less diaphragm design eliminates leaking rotational seals and failures due to run-dry pump conditions. Other advantages include the lack of exhaust air, the ability to handle abrasives, and its quietness, making it ideal for applications in close proximity to people.

THE BOTTOM LINE: OPERATING COSTS

It’s interesting to compare the 2” QUANTM EODD with a conventional 2” AODD. A 2” AODD transferring 300 liters per minute consumes 2,1 m³ of air and needs a 26kW air compressor to run. If it runs for 880 hours a year that adds up to 22.800 kWh in total. Compare this to a 2” QUANTM EODD which needs 1,6 kWh to have the same flow. 880 hours yearly operating time of a 2” QUANTM is only 1.480 kWh in total. A huge savings on energy!

EODDs are available in several configurations that correspond to the different types of glue being used as well as a variety of cleaning agents such as water, soda or others.

Finally, being true positive displacement pumps, EODD pumps like the Graco QUANTM e-series are highly tolerant of changing degrees of viscosity of the pumped glue. This allows them to deliver constant and consistent flow independent of counterpressure.

When choosing an electric-operated pump, Graco’s QUANTM electric-operated double-diaphragm pump is the preferred choice. It can stall under pressure, to prevent pump failures from clogged lines or closed valves. This is clearly a huge benefit in a glue pump. Its energy-efficient electric drive reduces energy consumption by up to five times compared to an air-operated pump.

In addition, the Graco Husky e-series can be set to reduce pulsations, so you no longer need a pulsation dampener – which contributes to its low noise levels.

REDUCED ENERGY CONSUMPTION IN PRACTICE

A leading UK corrugated cardboard manufacturer replaced 65 2” air driven pumps with the QUANTM electric pump for his glue circulation lines in 12 factories throughout the country. The impact on energy costs and carbon reduction is huge. The energy consumption dropped from 2,37 million kWh/year to 535.000 kWh/year. Taking into consideration the elimination of the cost of compressed air and air compressor maintenance, and the low maintenance costs on the QUANTM pumps their investment was paid back in less than 6 months. And not to forget that by switching to QUANTM, they reduced their carbon emissions by 80%.



THE IMPACT OF SWITCHING TO AN ELECTRIC DOUBLE-DIAPHRAGM PUMP ON ENERGY COSTS AND CARBON EMISSIONS

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QUANTM Electric

VS

Air-Operated



AN ELECTRIC PUMP WORKS ON DIRECT POWER



AN AIR DRIVEN PUMP REQUIRES AN AIR COMPRESSOR

POWER NEEDED TO PUMP 330 LPM OR 87 GPM

1,6 KWH*

26 KWH**

ON A YEARLY BASIS FOR 880 HOURS OF OPERATION

1.408 KW*

22.880 KWH**

THE AMOUNT OF CO2 EMITTED PER YEAR

0,42 TON*

6,86 TON**

THE ENERGY COST PER YEAR

€ 258***

€ 4.187***

* Based on a 2" QUANTM pump
 ** Based on a 2" ADDD pump
 *** The amount of CO₂ is based on an average of 0,3 kg/kWh
 The energy cost is based on an average of € 0,183/kWh





COMMON PROBLEMS WITH GLUE PUMPS AND HOW TO FIX THEM

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PROBLEM	SOLUTION
The higher the viscosity, the more difficult it becomes to prime the pump.	One solution is to apply light heat to the pump. This lowers the viscosity of the glue, facilitating priming and pumping.
Any glue left sitting in the pump will stick to the interior or solidify and cause a blockage.	Removing this set glue is difficult and time-consuming, and could damage the pump components. It is therefore essential to keep the flow of adhesive through the glue pump moving, or clear it out between processes to prevent issues.
Glue polymerizes upon contact with air.	When this hardened glue circulates in the line, it can block the line or the pump, which can cause the line to rupture. An EODD pump can stall under pressure without additional accessories being necessary to prevent blockage of the line or pump. Other electric pump technologies need additional costly accessories to prevent this from happening, such as pressure sensors, a controller, or extra equipment to create a bypass.

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WHAT GLUE PUMPS DOES GRACO OFFER FOR CORRUGATED CARDBOARD MANUFACTURING?

To help you select and configure an electric-operated double-diaphragm glue pump, Graco has broken down the process into three easy-to-follow steps. Each step has its own online guide, freely accessible to everyone on the Graco website:

WHAT SIZE OF PUMP TO USE?

The size of pump to use in a glue application depends on the length of the glue circulation line and the number of glue units that need to be fed. As a rule of thumb, for single-wall corrugated cardboard applications, use 1" and 2" pumps. For double-wall corrugated cardboard applications, use 2" pumps. In the return line, use 1" or 2" pumps.

WHAT CONFIGURATIONS TO USE?

To pump glue in a corrugated cardboard manufacturing plant, pumps are ideally made from cast iron, polypropylene or stainless steel. All these materials score highly in terms of resistance against abrasion and corrosion. The choice depends on the soda concentration of the glue used, as well as the size of particles in the glue. Each factory produces its own glue and the composition varies from factory to factory, so these factors have to be taken into consideration when selecting the appropriate pump body material.

Regarding inserts, Santoprene® is the optimal choice whatever pump body material is selected. Santoprene® does not corrode, nor react if the glue is heated.



WHY ELECTRIC PUMPS?

Graco recommends electric-operated rather than other pump technologies for glue transfer applications for the following reasons:

They **do not shear** the glue. Some glues are shear-sensitive, which means that the properties – and therefore the performance – of the glue could change while being pumped.

Electric pumps can **handle a wide range of viscosities**, and even high-viscosity glues. They are also highly tolerant to changing glue viscosity. This means that EODD pumps can continue to deliver constant and consistent flow, independent of counterpressure.

During the glue pumping process, an electric-driven pump **does not heat the glue**, as can some other pumping technologies. This is important, as the temperature of most glues should not exceed 45°C otherwise they could turn into gels.

EODD pumps can **stall under pressure**, preventing pump failures due to clogged lines or closed valves.

The **absence of mechanical seals** in an EODD means less expensive wear parts and avoids failure due to run-dry pump conditions.

The simple design and fewer parts of an electric-driven pump means **easier cleaning and faster maintenance** and repair. All of these translate into reduced downtime.

An EODD is **energy efficient**, translating into lower energy consumption, thus cutting the energy bill.

An electric pump is **significantly quieter** than a comparable pneumatic pump. It also gives less pulsations.

An electric pump is much **easier to control**, even remotely. This is a major advantage for metering and batching.

Electric pumps are **highly reliable**. They are ideal for highly abrasive fluids such as certain glues. Their robust construction makes them perfect for 24/7 operation.

Electric pumps offer **extremely safe** operation; they can run dry and are in general slow-stroking during standard operation.

Graco provides a full range of electric-operated double-diaphragm pumps under the QUANTM name. The range comes in various configurations that provide optimal pumping solutions to meet the challenges of abrasion resistance and the different types of glue being used, as well as the variety of cleaning agents such as water, soda or others.



Moreover, Graco provides comprehensive service and technical support for all its Graco pumps, throughout the world. This ranges from sales to ongoing pump maintenance. Graco's global distributors are trained and equipped to handle any pump problem.

Visit www.graco.com/corrugatedcardboard and find the electric glue pump that fits your corrugated cardboard needs. Or contact one of Graco's professionals (communications@graco.be) for more details or to arrange a product demonstration.



OUR BRAND PROMISE TO YOU

Since 1926, **innovation**, **quality** and **A+ Service** have been at the centre of Graco.

Experience Innovation

Our focus on innovation results in products and equipment that lead the industry with technologically-advanced features, pioneering design, high performance and unparalleled reliability. In short, innovation is how you get better products!

Building Quality

You're investing in high-quality products built to last for years of reliable service. Moreover, we partner with our customers to better understand how you're deploying our products in the field, then use your experiences to improve performance and durability.



A+ service, every time

You'll see A+ Service in action when you contact any of our support services options no matter where you are in the world. We'll listen to your situation and work methodically to resolve it as quickly as we can. We are guided by a mindset of integrity and a customer service view centred on collaboration and relationships, not transactions.



We're here to answer questions and help address your needs:

www.graco.com/contact

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