Wet corn milling is a process that gives starch as the main product output in addition to several other products. One of our customers processes 1.3 M tons of corn annually in two locations in China. The end products include 850,000 tons native starch, 450,000 tons of co-products including corn fiber and corn gluten meal, 100,000 tons of modified starch, 50,000 tons of L-lysine, 300,000 tons of starch sugar and 40,000 tons of compound fertilizer.

The PerkinElmer are used throughout the process to monitor and control the same. Instruments are installed measuring the following:

- Corn Germ after drying before storage
- Starch after separation, sieving and drying
- Gluten Slurry after separation before drying
- Fiber before storage
- Gluten Meal after drying before storage

*Figure 1. Workflow of corn milling process.*
**Corn Germ Measurement**

The DA 7440 GP is located on top of the silo, in a by-pass configuration. The Measurement results are used to optimise the drying process to ensure consistent and optimum moisture content in the germ. Too high moisture content promotes mildew growth, which must be avoided. However, over-drying effect yield negatively and must be minimized.

Further, it is important to ensure a good product flow so the measurement is accurate and repeatable. A stochastic flow with wildly varying product thickness could make the measurement noisy, something that should be avoided.

To ensure a good measurement situation, the chute at a suitable angle where the product is slightly slowed to build thickness and ensure smooth running.

The DA 7440 looks through a glass window on which the corn germ runs continuously.

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**Gluten Slurry Measurement**

The DA 7300 with the liquids interface is mounted on a vertical pipe with up-wards product flow. The measurement results are used to control the level of starch in the gluten stream. By continues monitoring, the operators can control and optimize the separation process to ensure only a small amount of permissible starch is present.

There is a sample port just underneath the instrument so samples can be taken out and analyzed for instrument validation and calibration development purposes.

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**Gluten Meal**

The dried gluten meal is measured by a DA 7300. The instrument is mounted in a chute on top of the silo after the meal is dried, just before the storage.

The instrument is used to optimize the moisture content before the protein is stored. Too high moisture content promotes mildew growth, which must be avoided. However, over-drying effect yield negatively and must be minimized.

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**Figure 2.** DA 7440 measuring corn germ moisture through a window.

**Figure 3.** DA 7300 installed in a vertical pipe, measuring gluten slurry after separation.

**Figure 4.** DA 7300 installed in a chute on top of the storage silo.
**Starch**

The moisture content in the starch powder is continuously measured after the drying and sieving, using a standard DA 7300. The line lay-out is such that the product path is vertical. This makes it difficult to install the instrument in the main path. Therefore, a by-pass pipe was installed and a diverter plate was fitted to ensure sufficient product would be diverted into the measurement path.

The measurement results are used to control the starch drying and ensures a consistent end product.

**Corn Fiber Measurement**

The moisture content of the corn fiber is measured by a DA 7300. The instrument is mounted in a chute on top of the silo after the drying, just before the storage.

The instrument is used to optimize the moisture content to ensure the product is within specifications.

The amount of product in the chute is sufficient, but small. To ensure suitable measurement conditions at all times, two baffle plates were installed. These funnel the product to the measurement spot, thereby ensuring good measurement conditions and stable, accurate measurements.

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*Figure 5. DA 7300 installed in a by-pass after starch drier and sifter.*

*Figure 6. DA 7300 installation point in a chute on top of the silo.*

*Figure 7. Baffle plates funnel the fibers to the measuring spot.*
The Result

The instruments are connected to the plant control system and used to control the moisture content automatically. The variability of the moisture has been significantly reduced after installing the DA 7300. Hence, the final product is more consistent making further processing easier.

Figure 8. Results reviewed in the control room.