

INSTRUMENTATION AND CONTROL

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1. Why Instrumentation and Control?

- There are many reasons for instrumentation and control in a seed processing plant.
- These include:-

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- To ensure safety of workers, visitors neighbours and passers-by
- Safety of equipment, machines, buildings and other structures
- Efficient use of utilities such as steam, water and electricity
- Increase productivity of machines
- Increase product quality regularity
- Increase flexibility of machines and processes
- Meet regulatory requirements such as consistent package weights within specifications

- In seed processing plants, the boiler is often fired by maize cobs.
- The on-off control described above is therefore not easy to implement.
- The minimum steam pressure is assured by maintaining adequate fire.
- A safety valve that releases steam to the atmosphere ensures that the maximum allowable pressure is not exceeded.
- In all cases a steam pressure gauge is installed.

(ii) Boiler water level

- The boiler tubes must always be covered with water to avoid overheating that leads to material failure and release of steam in the working environment.
- Two measures are taken:
 1. An automatic control system measures the water level and switches the water feed pump on when it is at the specified minimum value.
 2. A sight glass gauge is installed to enable the boiler operator to monitor the water level and to intervene when necessary.

3. Control of in-bin aeration

- The main objective of aeration is to maintain seed stored at 12-15% moisture content to within 3-6°C of ambient temperature.
- An aeration controller decides if, when, and for how long air blowing is needed.
- Sophisticated aeration controllers measure the temperature and relative humidity of the ambient air and the temperature and equilibrium relative humidity of the grain.
- Less sophisticated aeration controllers base their decisions solely on the air and grain temperature.

- Fan control is also important to ensure that it stops operating when the seed moisture content reaches a specified minimum value and starts operating when it reaches a specified maximum value.
- In direct heating systems, a mixing valve connects the hot and cold channels and controls the drying air temperature.
- The required drying conditions (T and RH) can be programmed based on the desired equilibrium moisture of the seed.
- The air flow is dynamic: higher at the beginning of the process and lower at the end of the process as the seed gets drier.
- Relative humidity of the incoming air is compared with that of the exhaust air. The drying process stops when the former is higher than the latter.
- Measuring and parameter settings are read out on a control screen and PC.
- Graphics are used to visualize the drying process.

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4. Control of in-bin supplemental heat drying

- The objective of in-bin supplemental heat drier controllers is to dry seed grain at minimum energy use without significantly affecting the storability and quality.
- Control of drying air temperature is important to ensure that the drying is effective and seed quality is maintained.
- An automatic control system measures the drying air temperature and adjusts the steam flowrate to maintain it at the desired value.

5. Control of Seed cleaning and treatment

- The seed feed rate is determined by the speed of the bucket elevators which can be controlled if variable speed drives are used.
- Control of air flow rate in the aspiration cleaner is important to ensure that the impurities are adequately removed without blowing away the good seed.
- Control of dosing of the treatment chemicals is important to ensure that good seed quality is achieved without excessive use of chemicals.

6. Control of seed packaging

- Instrumentation and control enables the selection of throughput and packaging size and maintenance of package weights consistently within specifications.

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