Novosibirsk: tel. +7 (383) 266-47-28, 212-56-35, fax +7 (383) 266-07-51, www.sinetic.ru
Angarsk: tel./fax +7 (3951) 56-46-59, 56-46-58,
Krasnoyarsk: tel. +7 (3912) 58-59-90, 52-15-70, tel./fax +7 (3912) 58-

Continuous batch-weighing feeder ”DOZA”

The batcher is used in various industries for continuous weighing of bulk materials in process flow.

The batcher can function both as a single device, and as a part of integrated batch-weighing system.

Batcher construction

The batcher is a certified system consisting of a weighing conveyor, an electric drive and a control system (fig. 1).

Its operational principle lies in continuous measurement of the mass flow.

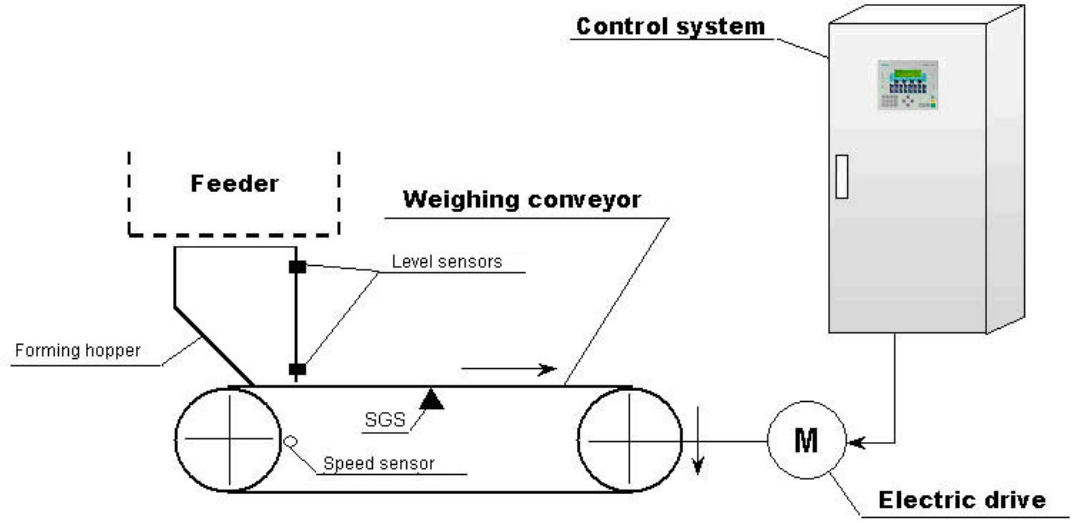

Fig. 1 Structure of the conveyor batch-weighing feeder

Principle of operation:

Values of the weight, measured by the strain gage sensor (SGS), and of the belt speed are sent to the control system. The control system performs continuous calculation of the actual mass flow of the material and compares it with the specified value. The regulation, i.e. maintaining of the specified flow rate, is ensured by adjustment of the belt speed.

The material is fed onto the belt through the forming hopper. The type of feeder (shaking, spiral, rotary, etc.) is dependent on characteristics of the materials. The system is equipped with sensors, detecting emptying and overfilling of the forming hopper (level sensors).

General specifications:

1. Capacity adjustment	2.5 to 250 ton/hour
2. Permissible error	0.5%
3. Width of the conveyor belt	500 to 2000 mm
4. Axel distance (conveyor length)	up to 8000 mm

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Control system based on SIMATIC C7-633 controller of SIEMENS production

The batcher control system performs processing of following signals received from sensors that are installed on the weighing conveyor and the feeder:

- signal of mass load to the belt, received from the SGS;
- belt speed, measured by rotation sensors of lead drum and driven drum;
- signals from belt displacement sensors (left/right);
- signal from belt revolutions sensor;
- signal from feeder sensor (feeder clogging);
- signals from sensors of low and high material level in the forming hopper.

Control system has been created on basis of **SIMATIC C7-633** programmable controller of **SIEMENS** production, combined with operator panel. The controller is provided with 16 built-in digital inputs, 16 digital outputs, 4 analog inputs, 4 analog outputs, as well as 4 multi-purpose digital inputs.

Russified LCD operation panel with 4x20 character display provides the representation of the process information and parameters input. Protection degree of the front side is IP65. Alarm messages, process data, hints and other information are shown on the display. Settings modification is protected by the password. The system automatically copies the data for last 30 days in the alarm message archive. Thus it makes it possible to track the batcher operation history.

Conveyor electric drive is controlled using **MICROMASTER 440** frequency converter of **SIEMENS** production with an integrated microprocessor control system which ensures a highly accurate control of electric drives. Overload protection of the converter and the motor is implemented in the system.

Drum motor of **RULMECA** production serves as an electric drive for the weighing conveyor. It is of a barrel-shaped construction. The drive is built inside the drum internal space and thus is completely enclosed. The unit is sealed and has a protection degree IP 67. The built-in reducer impacts the drum directly. Thus the efficiency attains the value of 97% and an absolute positioning of the belt is ensured.

Weighing conveyor is provided with a local control panel for switching of operation modes or performing the emergency stop.

The batcher control system provides:

- input signals processing and generation of control instructions for the conveyor electric drive and for the feeder;
- measurement of the conveyor belt speed with consideration of belt slipping;
- maintaining of the specified capacity;
- calculation of material weight for a specified time period;
- calculation and recording of statistical parameters (operation time, idle time, etc.);
- calibration;
- synchronization of feeder and weighing conveyor capacities;
- belt position control;
- tasks input using the keyboard on the cabinet front panel;
- indication of dosing parameters;
- emergencies supervision and alarm activation;
- information transfer to the PCS control room level.

Operation modes of the control system:

- "automatic" – controller-supervised dosing. All interlocks and control algorithm are enabled;
- "local " – execution of operations on calibration and setup, as well as mechanics adjustment. Control algorithm and interlocks are disabled.

Operation mode is switched from the local control station, operator panel, installed in the cabinet, or by the operator from the PCS control room.

Features of the control system:

The control system has been designed on basis of general-purpose equipment, produced by **SIEMENS**. The operation of such systems is easier comparing to those systems, which comprises equipment of several manufactures or involving unique solutions.

Application of programmable controller in the control system can be considered an advantage. Re-configuration, adding of external links, enhancement of algorithms requires only the controller to be re-programmed. The program code with a complete description and notes is an integral part of the documentation, which is handed over to the Customer together with the equipment.

Connection between the given control system and the PCS ***control room level*** can be performed in following ways:

- **C7-633** controller has an integrated MPI interface which enables information transfer over MPI protocol;
- on customer's request, required interface module for connection to **Profibus** or **Industrial Ethernet** networks can be included in the system;
- on customer's request, the connection over a freely-programmable protocol can be implemented using one of following interfaces: RS-232, RS-485, RS-422, TTY.

The control system is delivered in the cabinet with dimensions 1200x600x300 mm. The cabinet of **RITTAL** production (Germany) ensures IP75 protection degree for microprocessor equipment.

Operator panel with LCD display, functional keys and a power LED are located on the front panel of the cabinet.

References

Continuous batch feeders were installed and are in operation on following plants:
Krasnoyarsk aluminium plant,
Bratsk aluminium plant,
Belovo concentrating plant, Kemerovo region,
Uralkaliy, town of Berezniki, Perm region and others.

The given control systems was awarded on exhibitions of Krasnoyarsk Fair, Expo-Sibiria (Kemerovo) and Intersib (Omsk).

If you have an interest in continuous batch-weighing system, please fill in and send us the questionnaire (russian version). We will prepare the proposal and send it on the specified e-mail.
We will happily carry out your order.