Pictures: Rayman

Fig. 1: The dust removal section of the new Flow-Off system.

Dust Removal from Filters

High Efficiency and minimised Maintenance

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Classical dust removal systems are characterised by short maintenance intervals, short service life and high energy consumption. The new Flow-Off dust removal systems combines the dust removal equipment with a flow feeder that eliminates all moving parts and offers high efficiency at reduced operating costs.

Filters or electrostatic precipitators are used for separation of dust produced by technological processes in a number of industrial applications. Dust separated in such equipment is retained in discharge hoppers from where it has to be transported for further processing or disposal. Economic and environmental criteria as well as working environment protection must be taken into account during such activities. This has been achieved with the development of the Flow-Off system.

Present Solutions

Precipitating systems are mostly equipped with pyramidal or trench shaped discharge hoppers for dust collection and removal. The discharge hoppers are equipped with pressure closures preventing uncontrolled air suction into the precipitating system due to internal under pressure. Closures also supply the dust into downstream mechanical conveying equipment. Rotary feeders are most often used as the pressure closures; double flaps are used less often.

The dust from filters and precipitators is most often transported by screw conveyors interconnecting the pyramidal discharge hoppers or by pneumatic air slides in a smaller number of cases.

Dust is transported to the store or for further processing manually, e.g. using Big Bags, or mechanically by screw conveyors or redlers. Pneumatic conveying systems are used only in some special cases.

Current technical solutions have several disadvantages, including wear and abrasion of rotary feeders, flap gates, and mechanical conveyors, short maintenance intervals and a short service life. In addition, these systems are characterised by a high power consumption due to continuous operation of feeders, conveyors, gates, etc., and their susceptibility to dust leaks.

A new Method

The Flow-Off dust removal systems, which combines the dust removal equipment with a flow feeder, was designed with the aim of eliminating the above-mentioned disadvantages and developing an equipment with low operational demands. Installation of a trench shaped discharge hopper under the filter is the prerequisite for use of the new system. The dust removal equipment consists of a body with the length identical to that of the trench shaped discharge hopper. The bottom of the dust removal equipment is semicircular and is slightly inclined towards the discharge neck. Bottom of the dust removal equipment contains aeration elements.

The Flow Feeder supplies the dust through subsequent conveying pipeline

into the target area. With regard to the possible height of the gravity chamber and quantity of the dust, the material may be conveyed over distances exceeding 100 metres. The Flow Feeder does not contain any moving parts that would get into contact with the conveyed material.

Air blower station or compressed air network can be used as the conveying air source. With regard to the limited height of the filter's discharge flange above the terrain or floor level, most applications will work well with an air blower with the discharge over pressure up to 50 kPa. Advantages of the system include:

- general tightness,
- no air is sucked into the filter,
- no moving parts or bearings,
- high wear resistance,
- low equipment maintenance,
- long service life,
- simple electrical and control system,
- environmentally friendly,
- low energy consumption.

Equipment Operation

The Flow-Off can be operated either continuously or intermittently depending on the quantity of the dust and conveying capacity. During continuous operation, the dust runs from the filter discharge hopper down into the dust removal and further into the gravity chamber of the Flow Feeder which conveys it continuously into the destination area. This mode of operation is convenient for higher dust volumes and lower overall height for the Flow Feeder.

In intermittent operating mode, two level indicators have to be installed in the discharge hopper of the filter. Dust is collected in the filter discharge hopper. Once the top level is reached, the equipment starts, the material valve opens, the dust is aerated and conveyed through the Flow

Fig. 2: The Flow Feeder contains no moving parts.

Feeder into the destination area. Once the dust level in the discharge hopper drops down to the minimum level, the equipment is shut down and waits until sufficient dust quantity is collected again.

It is difficult to define any specific technical data because the equipment can be used for a broad scale of applications. The basic technical data of the system are:

- trench discharge hopper lengths 1 - 20 m
- trench discharge hopper widths 200 - 500 mm
- dust quantities 10^1 - 10^3 t·h^{-1}
- conveying distances 10^1 - 10^2 m
- conveying air consumption for the dust removal equipment 7.5 - 11.5 m^3·h^{-1}·m^{-1}
- Flow Feeder air consumption 100 - 600 m^3·h^{-1}
- conveying air pressure 50 kPa

The system can be installed on filters removing dust from drifts on mechanical conveying systems, technological filters of power plants, cement plants, metallurgical works, lime works, brick plants, ceramic plants, and anywhere else where airborne dust needs to be captured and separated. In addition, the equipment is highly suitable for abrasive dust conveying. As it does not comprise any ignition source, it can be even used for explosive dust conveying.

Summary

The new dust removal system eliminates most disadvantages of other presently used technical solutions at comparable investment costs. The costs of conveying air source are fully compensated by the savings achieved on the filter side (lower price of the trench discharge hopper, no need for revision gates on each hopper) and by eliminating the need for rotary feeders purchase. Additional savings can be achieved on electrical system and I&C. Last but not least, it is necessary to consider significant savings in the area of operating and maintenance costs. Not to mention the savings resulting from reduced damage and burden to nature and working environment.

The equipment together with the filter forms a single operational and functional unit. When designing a new Flow-Off system, it is thus necessary to ensure that the equipment designer closely cooperate with filter designer and manufacturer. ■

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