Storage Silos
Introduction

FLSmidth Ventomatic® offers technologies in the fields of material handling, storage, packing and dispatching with particular experience and focus in the cement, fertilizers, mining and other building material industries.

FLSmidth Ventomatic provides since many years a wide range of cement silos from small to large capacity, in concrete or steel. The concrete high capacity silos, of up to 30,000 tons, are more than twenty meters in diameter and are suitable to store, mix and extract cement, fly ash and slag.

Hundreds of FLSmidth Ventomatic silos are in operation in many different environmental conditions and in the most demanding markets.

The inverted cone silo is the technology selected by FLSmidth Ventomatic as standard design because of the inherent advantages of this type of design:
- Very high extraction capacity, of up to 1000 tons/hour to serve several users;
- Low power consumption during operation;
- High emptying rate (up to 99%);
- Reduced maintenance thanks to a simple design and limited equipment installed;
- Optimized civil costs.

Example of inverted cone silos

Inverted cone cement silos in Libya (FLSmidth plant)

Packing plant and cement storage silos under construction in St. Louis, USA

Internal arrangement of silo with open ariside
Inverted cone silo technology

Process
At the silo base a steep cone (A) deviates the product toward the outer circumference of the bottom of the silo chamber. An annular area (B) by open air slides fluidises the product to be extracted from the silo. A control system keeps a constant quantity of product within the bin so to feed under stable conditions the users from one or more outlets (E).

Based on the required output, the control system automatically adjusts the extraction rate in order to match the need for cement to serve different outlets such as packing lines, bulk loaders, etc., depending on their respective consumptions.

The open air slides at the bottom of the silo and the central bin are fluidised with blowers while closed air slides get air from fans.

Many other equipments as level indicators, air balance valves, inspection doors, pneumatic valves, shut off and flow control gates and filters are parts of the silo. All this equipment is supplied by FLSmidth Ventomatic.

High energy efficiency

Only a minimal part of the base area of the silo (A) needs to be fluidized. The central inverted cone displaces the material toward the external sidewalls of the silo. As a consequence, only a small portion of the base area (B) has to be covered with open airsides for the fluidification of the product.

The fluidized area is also divided into sectors (C), one for each extraction point. They are distributed along the base circumference feeding the central bin. The individual sectors can be partially fluidized (D).

Therefore, by reducing the air flow to move the product, the amount of energy necessary for the extraction decreases too. Moreover as per the silo working process, only a few percentage of the base area is fluidized each time.

The air distribution from blowers is managed with automatic valves. The sectors at the bottom level of the silo are fluidized in a sequence (E) controlled by a supervision system. In this way, the homogeneous emptying of the silo is guaranteed as well as minimum power consumption and a controlled cement flow.

A - Silo area
B - Fluidised area
C - Fluidized sectors
D - Contemporary fluidized area
E - Fluidized area
Advantages

Extraction ratio +99%
The geometry of the FLSmidth Ventomatic silo is designed to facilitate and maximize the emptying. With an efficient airflow distribution and optimal airslide coverage of the bottom very high performances can be achieved with extraction ratio above 99%.

High capacity and flexibility
The inverted cone silo has many extraction points along its base circumference, which grant a high flexibility in terms of capacity. The silo is designed to serve more outlets, for a total hourly capacity of more than 1000 tons/hour or to satisfy with one extraction point the requested output.

Building configurations

With the geometry of the inverted cone silo it is possible to have SINGLE or MULTICHAMBER configurations.

The multichamber configuration is very prized in cement plants thanks to its proven design and efficiency. Optimizing the space available as well as the costs of construction, one silo can store cement along with other materials such as fly ash and slag. Sometimes it is also required to store different types of cement, ready for distribution.

Typical configurations of ring silos:

2 Chambers
3 Chambers
4 Chambers
5 Chambers
Maintenance and accessories

The reduced fluidized area of the inverted cone silo together with the few devices installed inside it for its functioning, guarantee reliability and reduced maintenance.

The product extraction points are distributed along the circumference of the silo base. Within the silo the product vertically flows along the cylindrical wall. Such a movement reduces the formation of lumps and consequently the heavy maintenance for eliminating it.

FLSmith Ventomatic can supply the following accessories:
- Air slides;
- Flow control gates;
- Cement diverters;
- Bulk loaders (stationary or mobile);
- Lump Breakers;
- Shut off gates;
- Bulk loaders;
- Over/under pressure gates;
- Silo manholes.

Steel silos

For smaller storage capacities, typically of up to 4'000 tons, FLSmidth Ventomatic can offer very competitive solutions with steel silos. Bolted types ensure quick erection and possible relocations.

Their design allows high extraction capacities of up to 500 tons/hour, as well as extraction rates of up to 99%.

Thanks to a limited fluidized area, power consumption during operation is low.

Such silos are optimal for terminals where they can be used together with FLSmidth Ventomatic packing and dispatching solutions.

12 steel storage silos in Italy, with a capacity of 4'000 tons each.
Complete line of 4000 bags/hour including:
- Silo of 10'000 tons with integrated bulk loading system;
- GIROMAT® EVO rotary packer;
- INFILROT® Z40 bag applicator;
- VENTOSORT CUBE bag treating system;
- POLIMAT® C 40S palletizer.