Stacker and reclaimer systems for cement plants
Heavy-duty performance

Key benefits
All stacker and reclaimer systems are:
- Ideal for both prehomogenisation and buffer storage
- Designed for heavy-duty operation
- Compatible with products from all types of crushing installations

Ideal for both prehomogenisation and buffer storage of raw materials, FLSmidth stacker and reclaimer systems have an impressive track record of performance. FLSmidth has commissioned some of the largest stackers and reclaimers in the cement industry, matching kiln throughputs of up to 12,000-13,000 tpd.

We offer an extensive selection of stacker and reclaimer systems to meet precisely your needs.

Selection criteria
When planning which stacker and reclaimer system to use, you will need to consider various questions before selecting type and size:
- Homogenising effect required
- Future uprating of the store
- Open or roofed store
- Mill feed system
- Chemical characteristics of the materials to be handled

Prehomogenisation
Prehomogenisation is often necessary in the cement industry, in cases where the raw material chemical composition varies greatly.

Prehomogenisation is used primarily for the main components in cement production, i.e. limestone and clay. With the increasing variation in the grades of coal used for coal firing installations, there is a growing need for prehomogenisation and storage of coal. Depending on the properties of the coal used, a prehomogenising or buffer store is used. >>
Store types

Homogenising stores

CBS: Circular Blending Systems
- High continuous homogenising effect
- No end cone problems
- Optimum utilisation of space
- Fully automatic continuous operation (no change of pile)

BS: Longitudinal Bridge Scraper store
- Suitable for dry to moderately sticky materials
- Direct feed of free flowing materials
- Efficient adjustment of long term variations in chemical composition of raw materials
- Store capacity can easily be expanded

BE: Bucket Excavator store
- Only homogenising store suitable for very sticky materials
- Economical system for large stores designed for direct feed of any type of mill
- Optimum utilisation of space and roofing easy to install

Non-homogenising stores

PS: Portal Scraper store
- Suitable for all types of materials including sticky materials
- Different types of material can be stacked and reclaimed from separate piles
- Optimum utilisation of building when using overhead tripper
- Store capacity can easily be expanded
- Low initial cost

SS: Side Scraper store
- Suitable for sticky materials
- Different types of material can be stacked and reclaimed from separate piles
- Optimum utilisation of building when using overhead tripper
- Store capacity can easily be expanded
Methods

Blending effect
The blending effect \( H=S_{\text{in}}/S_{\text{out}} \) of a homogenising stacker/reclaimer system is generally determined as the ratio between the standard deviation \( S_{\text{in}} \) of one leading chemical parameter of the store input and the standard deviation of the same chemical parameter \( S_{\text{out}} \) of the store output. In principle, the standard deviation is reduced by stacking the material in a large number of layers and subsequently reclaiming these layers. Theoretically – without taking the particulate nature of the material into account – the blending effect is closely linked to the square root of the number of layers reclaimed simultaneously with stacking. However, almost every reclaimer operates with some kind of scraper or bucket chain arrangement, and especially with coarse particles the actual blending effect is lower than the theoretical value because it is limited by the number of particles between one pair of scraper blades or within a bucket.

Stacking methods
Longitudinal stores: The most commonly used stacking methods are Chevron, Windrow and Cone Shell. Basically these methods consist of stacking a large number of layers on top of each other in the longitudinal direction of the pile. According to the Chevron method material is deposited by the stacker moving to and fro over the centre line of the pile. The Chevron stacking method causes segregation of the material with fine particles in the central part of the pile and coarse particles on the surface and at the bottom of the pile. To ensure proper blending a Chevron pile must therefore be reclaimed from the face of the pile, working across the entire cross section. According to the Windrow method material is deposited from a number of positions across the full width of the pile. The Windrow method prevents segregation and ensures more even distribution of fine and coarse particles across the pile.

The Windrow method is preferred in cases where the reclaimer is only operating in one part of the pile cross section at a time or in cases where segregation would make an open pile base unacceptable – typically in coal stores.

The Cone Shell method is often used in cases where homogenisation is not necessary. The pile is formed by depositing material in a single cone from a fixed position. When this conical pile is full, the depositing of material moves to a new position and a new cone is formed against the shell of the first one. This process continues in the longitudinal direction of the store until the stockpile is complete.

Circular stores: Continuous Chevron stacking is the most commonly used method. The circular store has a round base with a ring-shaped pile being continuously stacked at one end and reclaimed at the other. Stacking takes

![Chevron](image1)
![Windrow](image2)
![Windrow - open pile](image3)
![Continuous Chevron](image4)
![Cone Shell](image5)
place in a fan shaped arc – typically 120°. With each sweeping movement, corresponding to two layers of material, the whole sector advances approximately 1/2° ahead.

**Reclaiming methods**

**On/Off mode:** The reclaimer is usually equipped with constant speed motors. The reclaimed material is carried by belt conveyors driven by constant speed motors and discharged into a feed bin of a relatively large volume.

Reclaiming capacity is higher than the mill requirement and the reclaimer therefore operates in an On/Off mode controlled by maximum/minimum level indicators in the feed bin. On leaving the bin, the material is proportioned and fed to the mill by weigh feeders.

**Direct mode:** If the materials are difficult to handle, it may be an advantage to avoid the intermediate bin between the reclaimer and the mill. This is possible in cases where material from one (or more) store(s) is to be fed to a single mill. In principle, the reclaimer must be equipped with speed regulated motors and an integrated belt scale. The transport and subsequent proportioning of the reclaimed material and additional raw material is effected by speed regulated conveyors.

Reclaiming capacity will always match the mill requirement and the reclaimer will operate continuously. The reclaimer in combination with the transporting belt conveyors acts as a weigh feeder for the reclaimed material.

**Control**

The stackers and reclaimers are controlled by state-of-the-art PLC-based technology designed for fully automatic operation.

The operation panel is a Touchview Graphic Flatpanel (TGF) with finger activated display. It combines all the necessary start/stop buttons, lamps and other indication instruments in one display that is easy to overview and operate.

The TGF is incorporated in the control desk in the air conditioned control cabin on the stacker or reclaimer. It connects the stacker or reclaimer to the central control system via serial or parallel communication.

The PLC make and type may be chosen in accordance with the individual requirements to facilitate communication with the central control system.

The operating status of the stacker or reclaimer and signal lamps for indication of working and alarm conditions can be monitored from the TGF.

The stacker and reclaimer control system is designed to enable complete testing before the central control system takes over. From the TGF it is possible to test both single components (valves, motors, etc.) and the operational functions of the stacker or reclaimer.

There are several parameter and configuration screens which enable operators to change operating limits and optimise production. This function ensures that the machine can be adjusted without having to use programming equipment.

Once the central control system is ready to function and communication with the TGF is established, all normal operation (start – stop, set point changes, etc.) will take place from the central control system.
The Circular Blending system, type CBS, is designed for continuous Chevron stacking in one ringshaped pile. Stacking is effected by a fanshaped sprinkling action in an arc determined by the type of material being processed to ensure appropriate homogenisation.

Reclaiming at the other end of the pile is effected by a bridge reclaimer working parallel to a radius line. For cement production the pile between the bridge scraper and the stacking zone is a buffer normally representing 3 1/2 to 7 days’ consumption.

The material enters the store on a rubber belt conveyor and is discharged into a centrally positioned inlet hopper on the stacker jib.
Homogenising store

The stacker is mounted on the centre column, which allows rotation in both directions simultaneously with the vertical movement of the jib. Its height above the crest of the pile is kept at a minimum to reduce dust emission.

Reclaiming takes place at the natural angle of slide. A raking harrow is mounted on the bridge reclaimer which rotates anti clockwise around the central column.

The sweeping movements of the harrow system cause the material to slide to the base, where the chain system then conveys it to the centrally placed outlet hopper. To loosen sticky and non-free flowing materials active live-harrows are available.

The homogenised material leaves the store by an underground rubber belt conveyor leading either to a hopper or direct to, for example, a cement raw mill.
The longitudinal Bridge Scraper store, type BS, operates with two piles. One pile is stacked while the other is being reclaimed.

A capacity of each pile covering 3½ to 7 days requirements is normally recommended for cement production.
Homogenising store

The material entering the store on a rubber belt conveyor is discharged from the jib of the stacker traveling on rails alongside the store at a preset speed. The height above the crest of the pile is kept at a minimum to reduce dust emission.

Reclaiming takes place from the face of a pile at the natural angle of material slide.

The bridge runs on rails on either side of the stockpile. On the bridge is mounted a raking harrow system whose sweeping movements cause the material to slide to the pile base. To loosen sticky and non-free flowing materials active live-harrows are available.

A scraper chain system conveys the material to the outgoing belt conveyor.

Skew running is automatically compensated for.

The system merely requires an operator when shunting from one pile to another.
The Bucket Excavator store, type BE is designed particularly for sticky bulk materials. The store consists of two or more longitudinal stockpiles stacked according to the Windrow method. While one pile is being stacked, the other is reclaimed at right angles to the direction of stacking. A capacity of each pile corresponding to between 3 1/2 and 7 days' production requirements is normally recommended.

The store normally has two stacking bridges, one at either end. The material enters the store on a rubber belt conveyor running along one side. It is discharged onto the upper conveyor on the stacking bridge in operation and proceeds to the lower reversible shuttle conveyor which stacks the material longitudinally according to the Windrow method.
Homogenising store

The bucket chain system, supported by the scraper arm, is suspended at a fixed angle from the bridge girders. Starting at the pit-wall a pre-determined cut of material is made by moving the reclaimer in the longitudinal direction into the pile. Subsequently, material is reclaimed from the full pile face when the bucket chain system traverses to the opposite pit-wall. A new cut in the longitudinal direction is made and the Bucket chain System traverses in the opposite direction.

The bucket chain system discharges the material onto a rubber belt conveyor on the reclaiming bridge.

This belt conveys the material to an outgoing rubber belt conveyor running along the side of the store.

The system only requires an operator when shunting from one pile to another.
PS – Longitudinal Portal Scraper store

The non-homogenising Portal Scraper store, type PS, is normally used in a production line as a bulk material buffer store.

The store operates with stockpiles placed in line. While building up one pile by Cone Shell or Chevron stacking another pile is being reclaimed.

The material enters the store on a rubber belt conveyor running along one side of the store. It is discharged onto a stacker jib which is raised and lowered in order to reduce dust emission. Alternatively, stacking can take place by using a tripper car supported by a frame structure above the pile.

The stacker and the portal scraper travel on separate rails along the store.
The portal scraper consists of a portal frame with a scraper chain system. The material is reclaimed by the scraper chain system and in a constant flow transported onto an outgoing rubber belt conveyor.

The PS1 (Portal Scraper with one arm) and the SPS1 (Semi Portal Scraper with one arm) is provided with one scraper chain only. The PS2 (Portal Scraper with two arms) has a primary and secondary scraper chain working on either side of the pile while the portal moves to and fro.

The two scraper chain systems are linked together at a knee joint. The secondary scraper chain lifts the material to the crest of the pile, feeding the primary scraper chain system. The primary scraper chain system conveys the material to the outgoing belt conveyor.

The system only requires an operator when shunting from one pile to another.
The longitudinal Side Scraper store, type SS, is used in a production line as a relatively small bulk material buffer store. The store operates with stockpiles placed in line. While building up one pile by Cone Shell or Chevron stacking another pile is reclaimed.

The material enters the store on a rubber belt conveyor along one side of the store.
Non-homogenising store

It is discharged onto a stacker jib which is kept close to the pile crest to reduce dust emission. Alternatively, stacking can take place by a tripper car supported by a frame structure above the pile.

The stacker and the side scraper travel on separate rails along the store. The side scraper reclaims the material by means of a scraper chain system which removes one slice at a time from the pile. The scraper chain fitted with blades or buckets conveys the materials to the discharge point above the outgoing conveyor.

The system only requires an operator when shunting from one pile to another.

1 Hoist for raising and lowering chain
2 Operator cabin
3 Outgoing belt conveyor
4 Reclaimer bogie
5 Scraper chain
6 Jib
7 Belt conveyor on jib
8 Stacker bogie
9 Operator cabin
10 Incoming belt conveyor
11 Hydraulic cylinder
12 Jib counterweight
Various stacker systems supplied by FLSmidth

Stacking from tripper car above the pile

Tripper car