Asia Cement has developed rapidly since its inception in 1957 and this year total cement production capacity is forecast to reach 25 million t, making this company a major player in these specific markets.

Asia Cement (China) Holdings Corporation was listed on 20 May 2008. In terms of production volume, it is one of the leading integrated cement producers in the Central Yangtze River Region (which includes the provinces of Jiangxi and Hubei) and a major integrated cement producer in the Sichuan Region (which comprises Sichuan province). The Group’s integrated operations range from the excavation of principal raw materials, to the production, sale and distribution of clinker and different types of cement and also ready mixed concrete (rmc) products, using road transportation locally and maximising the benefit of waterborne transportation along the Yangtze for
Schade Lagertechnik (Aumund Group) is proud to be associated with Asia Cement and its cement production facilities located both within Taiwan and along the Yangtze river, all of which are now serviced by Schade stacker and reclaimer equipment, handling raw materials, additives and solid fuels.

Within the Asia Cement group Schade has delivered examples of virtually every combination of equipment, as outlined herein by Barry Woodbine.
distribution to local grinding stations and distribution plants.

Sold under the “Skyscraper” brand, the Asia Cement Group’s cement and rmc products are sold in Shanghai and the provinces of Jiangxi, Hubei, Sichuan, Zhejiang, Anhui and Fujian.

Responding to the rapid growth in China’s cement market, Asia Cement (China) has achieved a unique competitive advantage over its peers by close attention to detail in management and operation, achieving high levels of availability and efficiency whilst respecting environmental and sustainability obligations.

For example, the total actual production volume of no.1, no.2 and no.3 rotary kilns at Jiangxi Yadong plant, and the no.1 rotary kilns at Sichuan Yadong plant exceeded their respective designed rated capacity by 21.43%, 19.48%, 25.61% and 21.36% respectively (source: Asia Cement). Clearly such levels of production can only be achieved if each part of the plant delivers an efficient and reliable performance.

As can be seen in Figure 2, at Hualien cement production and environmental protection need not be mutually exclusive. With plants located often in areas of outstanding natural beauty, Asia Cement has gone the extra mile to deliver not only world class performance, but also minimum visual intrusion. This philosophy is extended to the logistics surrounding the import of materials and fuels and to the distribution of clinker and finished product using short and long sea routes and the natural Yangtze River highway wherever possible.

In this respect the Aumund Group, including the products of Schade Lagertechnik, has played a part by delivering top quality reliable and efficient handling systems.

Clearly, kiln availability is always central to production and output, but with increased performance comes increased pressure on all of the associated materials handling systems to the preheater and from the clinker cooler. Any break in these equipment chains will cause a kiln outage and inevitable expensive production losses.
The association with the Aumund Group goes back to the early 1980s and includes the supply of clinker transports, bucket elevators and feeders. Notably, back in 1998, Aumund supplied some of its larger double bucket elevators, type BDW, for a handling rate of 1500 tph, which remains some of the largest equipment of this type ever constructed.

Also for Schade, the connection to the plants of the Asia Cement group began in 1982 in Taiwan and continued in China from 1998 with the delivery to Jiangxi Ya-Dong Cement Corporation of two bridge reclaimers handling limestone and coal at rates of 800 tph and 100 tph respectively.

Figure 3 shows the Schade bridge reclaimer working on the external limestone stockpile. Figure 4 shows the similar system employed in the covered coal stockpile.

In both operations the limestone and coal is delivered to the stockpile using a travelling stacker with a hydraulically operated luffing boom, as illustrated in Figure 1.

The operation and, most importantly, control of the stacker function is fundamental to achieving a stratified deposition of material on the blending bed.

In Figure 5 an additional stacker also handles various additives in the covered and open stockpiles, and the bridge reclaimer with dual harrows is able to recover material from both stockpiles operating independently.

The first limestone stacker delivered to Jiangxi Ya-Dong in 1998 had a boom length of 33.2 m and a design handling rate of 2000 tph, supplied along with two bridge reclaimers as previously mentioned. These systems form the core raw material and fuel storage facilities and are clearly fundamental to the operation of the plant as a whole.

The second major plant expansion came in 2006/7 with the addition of a second production line, requiring another complete set of stacker and reclaimer equipment of similar specifications.

A third line was launched in 2007 and a fourth line is underway soon – a real success story following a general unabated rise of cement demand in the PRC, which should in 2010 comfortably exceed the 1000 kg per capita barrier.

The stacker (Figure 6) builds the stockpile within a predetermined zone travelling back and forth between the zone limits with an incremental lift of the boom after each pass.

In this manner the material is deposited in layers in what is known as the Chevron pattern (Figure 7). Since the boom is continually travelling as the layers are deposited, any dissimilar materials are spread evenly through the stockpile and at any point along the length of the stockpile a section will include elements of every material type.

Furthermore, as anyone who has observed these stackers in operation will have seen, the larger material naturally falls to the outside of the stockpile, creating a concentration of lumps at the base. With the Chevron stockpiling solution the lumps are spread evenly across the full width of the stockpile and thus high localised concentrations are avoided.
The bridge reclaimer concept comprises a chain scraper reclaim conveyor mounted horizontally within the bridge structure, plus either a single or a pair of reciprocating harrows arranged to follow the material’s natural repose angle (Figure 8).

Each harrow has steel tines fitted across the full width and, as the harrow moves back and forth across the stockpile face, the material is encouraged to flow down to the reclaim conveyor below.

In this manner, elements of every layer of the stockpile are recovered simultaneously by the harrows and therefore the resulting output is a homogeneous mix of every grade of material contained within that stockpile zone.

In most of these applications the reclaim conveyor is raised up at the discharge such that the yard belt may be set at the same level as the stockpile, eliminating the need for any special foundations; simple concrete strip foundations are required only to support the reclaim rails.

Figure 9 shows how the chain scraper conveyor is raised up using chain guides to scrape the material up a formed steel trough directly onto the yard belt via a travelling feed boot. See also the harrow and tines shown here with the tine pitch becoming closer at the base to reflect the increased volume of material moved relative to the height from ground level.

Figure 10, courtesy of Asia Cement, illustrates very well the Jiangxi-Ya-Dong operation, including the four lines in total plus three sets of stacker and reclaim equipment.

Being on the shores of Yangtze waterborne transportation is the obvious solution for the import of solid fuels and additives direct from the dedicated wharf.

These dry bulk cargoes are discharged by grab crane from geared or standard bulk carriers such as may operate within the Yangtze at this level.

From the dedicated wharf the material is conveyed directly to the blending bed stackers using conventional enclosed troughed belt conveyors.

The connection between Schade and Asia Cement goes back a long way, but more recently in 1995 with deliveries to the Hualien plant comprising stackers and bridge reclaimers similar to that featured already herein.

The limestone stacker in Figure 1 is at Hualien and Figure 11 shows the associated bridge reclaimer with the preheater tower in the background. Viewed in the other direction the vista is totally changed, showing the forested limestone hills of the east coast of Taiwan in the background.

Operating in such areas of outstanding landscape value places a considerable environmental responsibility on the cement manufacturer to maintain the local ecology whilst at the same time striving to satisfy the market demand and maintain profitability.

Asia Cement has risen to this challenge and was awarded ISO 14001 accreditation back in 1996. The Hualien plant continues to receive recognition from government, visitors, and its peers, both in Taiwan and worldwide, and has frequently been cited as a model of environmental protection by governmental and academic organisations.
This extends to the reclamation of expired quarry areas using native flora and, in particular, specific policies have been adopted to support local fauna, such as the butterfly protection project.

A core part of this level of environmental protection is the prevention of fugitive dust and in this respect stockpile management is key. Generally, for external limestone stockpiles, this is not a major issue and the fundamental operational philosophy of the blending stacker minimises the material freefall and therefore mitigates dust generation. If necessary, surface wind blown dust may be controlled by water mist spray.

However, for additives in particular, some of which may be very dusty, an enclosed stockpile is generally the preferred solution and, at Jiangxi, Asia Cement chose the semi-portal reclaimer by Schade as typically illustrated in Figure 12.

In this configuration the reclaimer chain scraper conveyor boom is supported from above using what is effectively half of a portal frame with the upper part running on a high level rail supported on a load bearing concrete retaining wall.

With this system the storage hall may be easily divided into many sections to store dissimilar materials and the reclaimer may travel over the discrete stockpiles to reach the selected operating zone.

For this equipment design a straight reclaimer conveyor discharges the bulk material over a wharf formed into the concrete structure and arranged to transfer on to a collecting belt conveyor at low level running parallel to the stockpile.

As can be seen in Figure 13 the reclaimer boom raises clear of the stockpile and internal storage bay retaining walls. In this typical application, fuel and additives are delivered to the storage hall by a travelling shuttle conveyor mounted within the building apex supported by the structure.

Generally, one conveyor is used per reclaimer and the individual additives in particular are discharged one by one to their respective storage silos.

The semi-portal design is ideal for multiple segregated stockpiles within a common building structure using the load bearing concrete retaining wall to maximise the storage volume within a compact footprint.

The semi-portal reclaimers were installed at Hualien in 1995 as part of the then major plant upgrade. However, as previously mentioned, the Schade connection with Hualien goes back even further to 1982 with the delivery of a combined stacker and portal reclaimer handling coal.

With a rail span of 46 m, a stacking capacity of 600 tph and reclaim capacity of 300 tph, the unit is not large by modern standards but is important since it combines the stacker and reclaimer onto a single portal frame saving on machinery plus civil and electrical installation costs.

Obviously stacking and reclaim cannot be carried out simultaneously, but where a large strategic stockpile is required to receive imported coal quickly, from say ship or railcar discharge, and then reclaim at a lower rate to a secondary blending bed acting as buffer storage capacity, this is an ideal solution. In this situation the blending bed provides a continuous supply of fully homogenised
blended coal to the mill bunkers and the strategic stockpile provides high capacity storage, which may be segregated into sections representing coal from different sources.

With this equipment a common yard belt is also employed to bring the coal to the stacker and take away the reclaimed material, including a bypass facility allowing coal to be directed on to the blending bed.

With this arrangement the tripper system used to discharge coal to the stacker boom is split into two parts. The lower part head chute is bifurcated, allowing coal to be delivered either onward to the stacker or directly to the ongoing yard belt below. This solution, combined with the integrated stacker and reclaimer, gives maximum flexibility in operation in an economical package without sacrificing performance or reliability.

Shortly after this “Combi” machine was commissioned, Asia Cement came to Schade again for its Hsinchu plant, again in Taiwan but in this case a circular storage was supplied to handle limestone (Figure 15).

This installation comprises a bridge reclaimer with singled sided harrow plus a radial stacking boom all mounted to a single vertical column, which is extended to support the incoming belt conveyor.

The blending principle is similar to that used in the longitudinal blending bed system, but in this case the stockpile is wrapped around the central column.

The general principle is illustrated in Figure 16 where the bridge reclaimer chain scraper conveyor discharges the limestone to the central outlet at a rate of 500 tph.

At the outlet, a conical feed boot is provided for the ongoing belt conveyor and often an intermediate feed point is included with perhaps a vibro feeder allowing discharge by gravity during reclaimer maintenance.

Since the whole system is supported on the single central column there are no loads imposed on the building structure, which may therefore be relatively lightweight, using either a fabricated construction clad in profiled sheeting, as in this case, or alternatively a geodesic dome design.

The circular storage solution is generally the most economical alternative and provides a high storage capacity for a relatively small equipment footprint. Being totally enclosed there is no risk of dust escape and the installation is not only pollution free but also aesthetically acceptable, offering minimal visual intrusion when working in sensitive areas.

Whilst clearly Asia Cement is a very important player in the Taiwanese market, the real opportunities for growth come from across the East China Sea and along the Yangtze corridor.

Starting production in the year 2000 with the Jiangxi Ya Dong project, Asia Cement now operates plants from the Yangtze River delta through to the Sichuan province, attaining a market share of between 15% (Nanchag) and 22% in Chengdu (2009) where it is the largest single player.

Schade has supplied many of the stacker/reclaimer systems for this expansion, with recent deliveries to the Sichuan plant based on the already established bridge reclaimer design, as pictured in Figure 17.

In addition, for Sichuan, Schade has supplied a larger portal type reclaimer for limestone with a reclaim rate of 700 tph plus smaller semi-portal machines for coal and additives as illustrated in Figure 18.

This is an interesting design, appearing as a combination of portal and semi-portal concepts where a low level raised concrete stockpile retaining wall is used to support one side of the portal.

In addition to the extensive equipment already delivered, as pictured herein, Schade has ongoing projects with Asia Cement, including portal and bridge reclaimers for its Sichuan, plus Hubei and Huanggang plants.

Such success as enjoyed by Asia Cement does not come by accident, but is the result of meticulous attention to detail to achieve the highest level of plant availability ensuring maximum performance and operational efficiency.

By choosing Schade for these important projects Asia Cement has clearly demonstrated its ongoing commitment to world class engineering standards.

Figure 16. Circular storage concept design.

Figure 17. Bridge reclaimer - Sichuan plant.

Figure 18. Semi-portal reclaimer - Sichuan plant.