



The decline of the Japanese aggregate industry was kept at bay in the 1980s and early 1990s, thanks to a number of government infrastructure projects.

SAND INDUSTRY LEADS REVIVAL OF JAPANESE AGGREGATES

Once the second largest aggregate market in the world, the Japanese aggregates industry has been through traumatic times in the last 30 years. **Andi Lusty** recounts the reasons why and what the industry is doing to rebuild.

The Japanese construction market collapsed when the housing market bubble burst in the late 1980s from the extraordinary values seen in the late 1970s. Houses are still difficult to sell in many areas today as supply exceeds demand.

The Japanese government's reaction to the recession was to embark upon large infrastructure projects which kept the decline of the aggregate industry at bay for several years. Large bridges and other

projects provided employment and aggregate demand, but the investment could not be sustained and by the mid-1990s the construction industry generally moved into the doldrums. Eventually, the two major suppliers to the industry were forced to merge and in the main to live from a declining aftermarket requirement.

The Japanese economy has seen a recovery of sorts driven by export demand in the main due to a booming Chinese market,

but also due to a decade of continuous growth in both the North American and European economies, which now show signs of slowing. While the housing sector has seen some recovery, the public sector has not. Major public works have been drastically cut back and the quarry industry has remained in the doldrums.

ENVIRONMENT AND SUSTAINABILITY

The only niche in the aggregate market to show any sign of life was the sand sector. Japanese sand supplies came from three major sources: gravel pits, dredging and barged imports of both from Asia. All of these sources came under increasing pressure from environmental interests, with permits not being renewed and most countries refusing to export sand to Japan due to the same problems at home. The need to find a new source of sand that was both environmentally acceptable and sustainable was growing.

Despite the rapidly falling demand for sand generally, the availability of natural sands was falling even faster. The industry had to meet the shortfall somehow. The first reaction was to blend increasing percentages of manufactured sand with the natural product. The result was a sand that was usually coarser (not ideally shaped) and unevenly graded, producing a less workable concrete that frequently demanded more water and cement to achieve similar strengths to those previously achieved.

These "blending sands" were shaped through autogenous impact crushers but the resulting manufactured sand still had to meet the sand specification (in accordance with the Japanese Industrial Standard [JIS]) with a minimal fine filler content (the maximum allowed being seven percent of -75 micron stone dust). This invariably meant that the manufactured sand had to be washed. Two more problems emerged: the need for water and the issue of filler settling ponds and disposal.

DRY CLASSIFICATION

The idea of dry fines classification has always been problematic due to the moisture content limitation for effective air separation. While this limits the process, it is now gaining a foothold in the market as most fine products coming directly from a dry crushing process will indeed have moisture contents below two per cent, even in wet conditions. In certain circumstances, it can also justify the provision of shelter for the tertiary/quaternary feed stock to ensure that the fine products can be classified in a dry circuit.

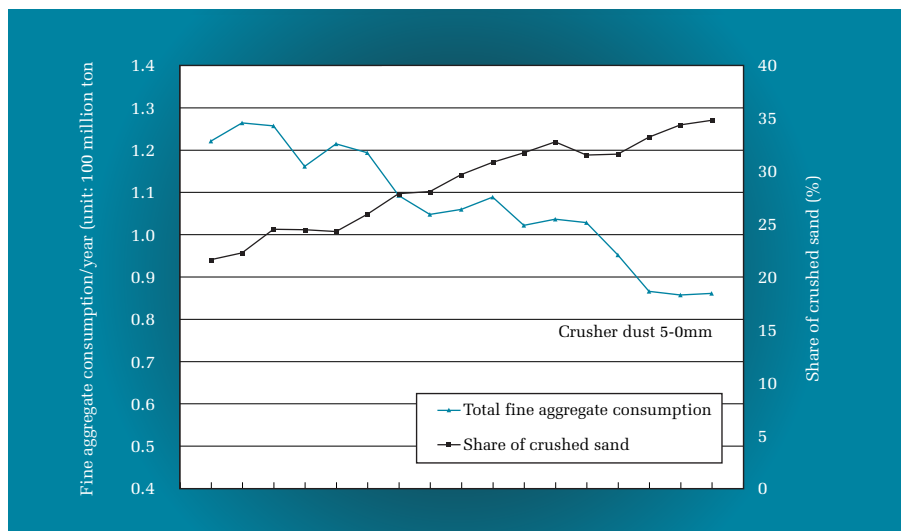


Fig 1: An overview of Japanese sand tonnages in the last 20-30 years.

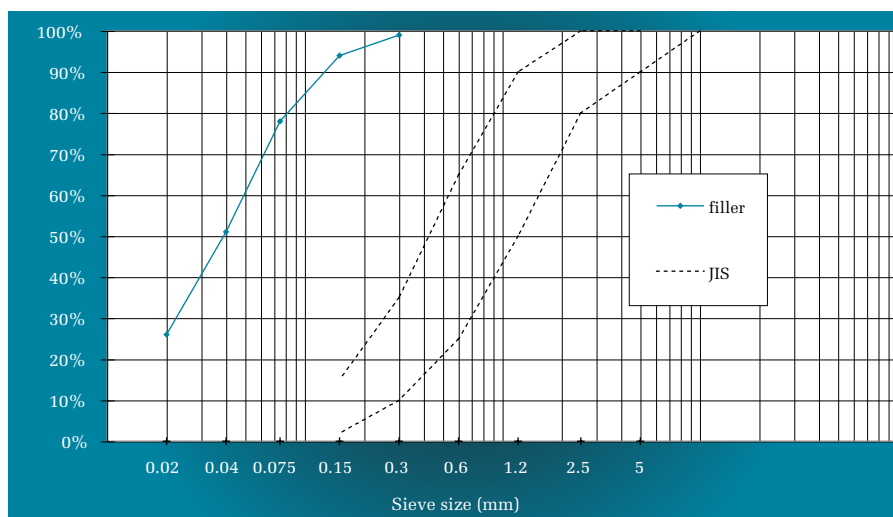


Fig 2: A grading of Japanese limestone sand.

However, this classification still does not correct the gradation of the blended product as the manufactured sands were all deficient in the 150 micron to 1mm sizes, meaning that very fine natural sands were needed to achieve a more evenly graded product to meet the JIS specification. If the quarries were able to manufacture a sand that was a complete replacement for natural sand, then there was clearly an economic justification to do so. However, as the industry was in a state of contraction, few had the capital or the inclination to make investments in the quarry.

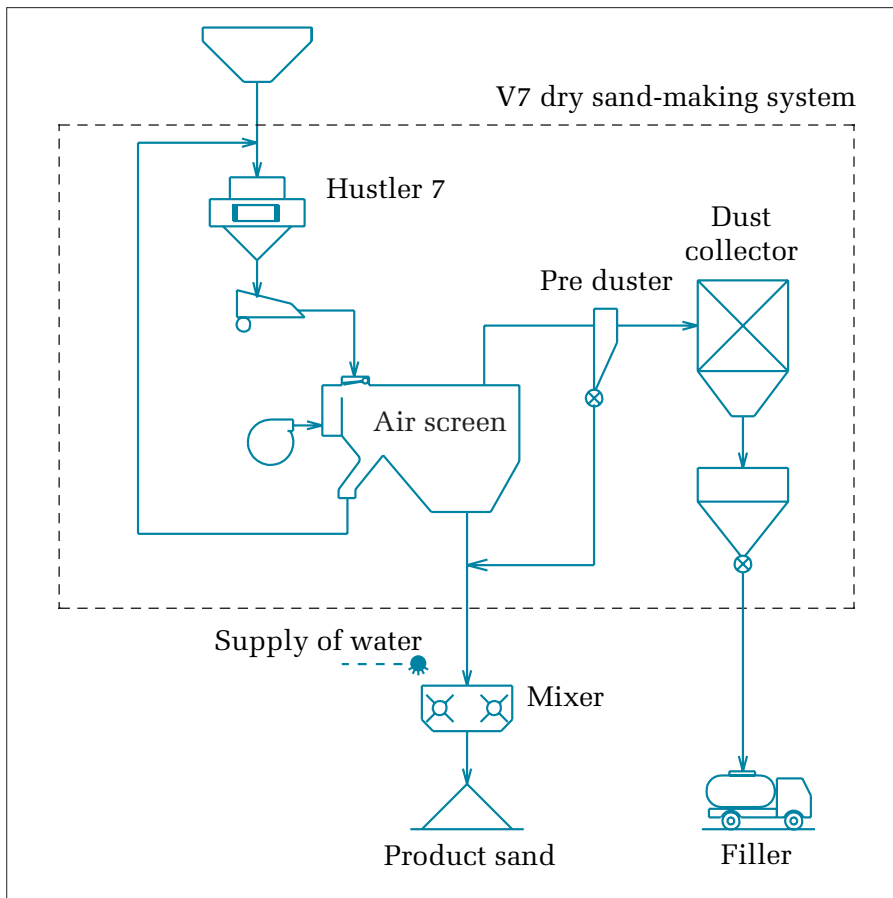
A FAMILIAR STORY

So far, the Japanese story has many similarities with the developing situation worldwide, where sand supply issues are coming under discussion with existing deposits

being run down, and the alternatives being either environmentally questionable or simply too expensive - particularly as the price of oil has escalated. Every market is under varying degrees of pressure, but the cost of haulage dictates that each market is now limited to a 60km to 100km radius of the supply by truck, and as dredged sand supply has increased to meet demand, sources are having to be found at greater distances, increasing the cost again.

A SUSTAINABLE SOLUTION

The market niche did attract a lot of attention as the availability of natural sand reduced and at the same time the price increased. Kotobuki Engineering & Manufacturing Company (Kemco) was one of the Japanese quarry industry suppliers who heavily focused their research effort on this problem.



An illustration of the V7 dry sand-making system.

The result was a plant (the 'V7' as it is known) that emerged toward the end of the millennium. It meets the considerable demands of the industry: to produce a sand to completely replace natural sand in concrete, having both well-shaped particles throughout and the ability to make an evenly graded sand meeting the stringent JIS specifications. They also demanded that the plant had to be sustainable using a low value feed - crusher dust, and environmentally friendly in operation with a dry circuit, to be dust free and quiet. Kemco has clearly succeeded with the V7 plant.

These plants started to appear in the market in 2001, and nearly 50 plants have been sold since then. What is of great interest is how the market is now developing. The aggregate plants that have installed the V7s have begun to reconfigure their operations. Instead of the balance of their products being heavily weighted in favour of coarse aggregate production, with the fine proportion generally being of a lower value, they are now moving toward a more even balance, with sand supply being a

significant component. Of most importance, the fine aggregate sand supply has become their most valuable product. The advantage of being able to supply consistent coarse and fine aggregate together to the same customer base is very significant, using all of the same sales channels. With minimal increased marketing and administration costs, and only incremental extra extraction costs, quarries have been able to increase their turnover (or replace falling coarse aggregate sales) with new fine products, which now also realise their highest profit margins.

The new sand (now branded as Kayasand, so called after its designer and Kemco's chief engineer Takato Kaya), exhibits excellent characteristics in concrete as a complete replacement for natural sand. The shape of the particles is cubicle even in the fine sizes, and the gradation can be adjusted and held at a level within any of the standards set by ASTM (American Society for Testing and Materials), JIS or BS (British Standards). The concrete is clearly easily worked and pumped without any extra power associated with mis-

shaped aggregates. There are none of the finishing issues associated with crusher dust in concrete.

CEMENT INDUSTRY

The increasing demand for good sand was not lost on the Japanese cement industry, one of the few industries that has enjoyed a great demand for their products even up until today. Indeed, they have continued to invest in capacity worldwide. There were two compelling reasons for the cement industry to take note of what was going on. First of all, their cement production capacity restraints were mainly in the grinding arena, and the V7 plant's waste is a finely ground filler, and second, they recognised that all of their local customers would be interested in a good limestone sand, as their own existing supplies were dwindling and becoming more expensive.

The cement companies were not limited by capital constraints, and the export demand for their product ensured that they were looking for new ways of increasing plant capacity.

The same imperative was clear to them: sell the new sand product through the same sales channels, adding a new valuable product to their output at the same time as increasing cement production by making full use of the filler by-product to expand their grinding capacity. Very little extra capital has been required to increase cement output by the volume of filler being added from the V7 plants.

As in most cement production units, each is supplied by its own significant source of calcium carbonate, and there was minimal marginal cost involved to increase output from the quarry. Cement products are mostly shipped by sea, and the Japanese companies sell this new Kayasand through their highly efficient port terminals now modified to handle both cement and Kayasand.

This new plant appears to have solved many of the problems attributed to the manufacture of an acceptable sand for the concrete industry, in a controllable dry system. It has certainly changed the face of the Japanese sand industry. Already around two million tonnes of Kayasand are sold in Japan each year, representing about 20 per cent of the total market - this proportion is sure to continue to grow as the market develops. Most recently, the Japanese authorities have approved Kayasand for use in the concrete for their latest nuclear power plants, broadening the scope of use even further. •

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