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Industry Overview – Business Financial Planner, Merrill Lynch

Concrete Industry

The only substance people consume more of than concrete is water; every year one ton of concrete is produced for each person. According to the National Ready-Mixed Concrete Association, the ready-mixed concrete market totals 250.0 million cubic yards per year. The ready-mixed concrete industry is a very localized industry dominated by small firms, since there is only a 90-minute period of "perishable time" for use, once the product has been mixed and placed in a truck for delivery.

Home builders use approximately 40.0 percent of total ready-mixed concrete. Commercial construction and public works, including paving, consume 40.0 percent and 20.0 percent respectively; the farm market uses about 4.0 percent. Ready-mixed concrete is used primarily in new construction, so the fortunes of ready-mix concrete depend on that market.

Concrete contractors are optimistic about a variety of markets with the upturn in the economy and in construction activity. Volume is increasing in the concrete renovation market, but competition is still keen as more contractors go into this segment of the industry.

CONCRETE PRICES

Cement quotes currently average $60.00 a ton, but prices vary widely by region, since cement cannot be transported profitably very far over land. Price increases of $3.00 to $6.00 a ton have gone into effect in several areas, and in most other regions, similar increases have been announced effective April 1, 1996. Prices rose fastest in the Southeastern U.S., and the smallest gains occurred in California. Economic conditions are beginning to improve on the West Coast, the only region that currently has some excess capacity. Since 1992, price increases have averaged between $4.00 to $8.00 a ton annually. Industry analysts expect this pattern to continue through 1999 (Value Line, 1/19/96). Cement and its aggregates will continue to benefit from rising prices in 1997, according to Value Line (4/19/96). Plants in most regions of the country have been operating at full pace for more than a year.

IMPORT MARKET

Tariffs had eliminated dumping by foreign suppliers during the first part of the decade, which alleviated the pricing pressure that followed such activity. Currently, imports are controlled by domestic producers, who import cement to maintain market share.

Because domestic producers underestimated domestic production capacity, cement imports jumped 51.0 percent during the first half of 1995, and at year's end, were up 39.0 percent, constituting almost 18.0 percent of total supply. Merrill Lynch reports that imports are predicted to drop by at least 5.0 percent in 1996 as the market adjusts, to about 16.0 percent of total supply. The somewhat confusing pattern of 1995 should not obscure the fact that U.S. demand remains far in excess of U.S. supply, and that imports are needed to fill the gap. Merrill Lynch's economic model predicts that the cement sector's fundamental pattern tends to lag behind that of the overall economy and be noticeably "later in cycle" than other building products that are more housing sensitive. Moreover, the initial phase of the next cyclical decline in cement consumption will come entirely out of imports, leaving domestic prices relatively unaffected (Merrill Lynch, Cement Industry, 12/29/95).

Federal Fuel Tax On Concrete Mixers

Under current Internal Revenue Service (IRS) rules, ready mixed concrete producers are paying federal fuel taxes on the fuel they use to turn their concrete mixer drums, despite a specified exemption from taxes on fuel used off-highway. The current regulations, which were originally written over thirty years ago, allow a credit for fuel used in special equipment only when a separate engine powers the equipment, and disallow a credit in cases where only one engine or motor is used to fuel both highway travel and the special on-site operation, as concrete mixers do. When the regulations were originally written, there was no reliable method of substantiating non-highway consumption, as there is now. Georgia, Kansas, Kentucky, Michigan, Missouri, Ohio, Oklahoma, Virginia, West Virginia, and Wisconsin currently allow a form of rebate for fuel used to turn a concrete mixer drum (Federal News Service, 7/11/95).

Polymer Concrete

Polymer Concrete, or PC highway overlays, use a dense, impermeable layer of custom formulated polymers to replace Portland cement as the glue that binds together the separate particles of concrete, primarily sand and stone aggregates, into a solid mass (Composites Technology, March/April, 1996). The result is a material that protects road and bridge deck surfaces from water, de-icing salts, acids, and petroleum products that can corrode the steel reinforcing bars (rebars) that are imbedded in concrete.

Since the late 1980s, up to $10.0 million worth of polymer concrete overlays per year have been set, according to spokesmen for the Virginia Transportation Research Council and the task force that developed the PC overlay guide specification. While pound for pound, PC is more expensive than traditional concrete, PC overlays are more economical because they use less material. PC also requires considerably less down time. In 1995, installed costs of PC overlay jobs were as low as $20.0 per square yard, considerably less than in the early 1980s (Composites Technology, March/April, 1996).

According to industry analysts, polymer concrete accounts for only 1.0 percent or 2.0 percent of the total concrete market, but it appears to be growing at a rate of about 30.0 percent per year. This is still a young industry, so market volume statistics are not yet separately tracked by either the composites or concrete industry associations. Also, the entrepreneurs who drive this industry are somewhat reluctant to share market information. However, individual companies in various segments report market growth from 10.0 percent to 60.0 percent in 1995.

The Guide Specifications for PC Bridge Deck Overlays was published jointly in October, 1995 by the American Association of State Highway and Transportation Officials, the Association of

General Contractors, and American Road And Transportation Builders Association. The document compiles existing specifications that conform to the American Society for Testing and Materials (ASTM) test methods. The specifications have been successfully used in various climate conditions in the U.S. It covers epoxy, unsaturated polyester styrene, and methacrylate polymers used in slurry, premixed and multiple-layer overlays. Industry sources note that if the overlays are constructed in accordance with these specifications, they should last from 10 to 25 years, depending on the volume of traffic.

Epoxy Injection and Post-Tensioned Structures

Post-tensioning consists of embedding unbounded steel cables within concrete spanning elements. The concrete is allowed to cure for a period ranging from several days to several weeks. The cables are then placed in tension to induce a compressive force within the concrete, allowing it to work more efficiently. This allows larger spans and reduces the weight and cost of construction. However, post-tensioning also alters the structure's behavior in ways that must be taken into account at the earliest stages of a building's design (Progressive Architecture, 11/95). Because concrete shrinks as it cures, stresses are introduced in the material if it is constrained by supporting elements and the building's geometry. Because of this shrinkage, the floors and walls of post-tensioned structures often crack or settle.

Environmental Concrete

According to Civil Engineering, the industry is trying out some new ingredients processed from old materials, finally exploiting concrete's environmentally beneficial properties. Whether recycling hazardous wastes or containing them in concrete reinforced with recycled polystyrene plastic, the industry is hoping that concrete can be a major tool in conserving natural resources and helping to dispose of wastes. One company's cement plants are recycling more than 250,000 tons of industrial by-products each year. Facing a substantial rise in landfill dumping fees, more waste generators find it cost effective to pay cement plants to take the materials. Most cement plants use substitute raw materials to some extent.

Although concrete takes a lot less energy to produce than materials such as steel and plastic, its production process is still very energy-intensive. The average energy needed to make a ton of cement in a U.S. kiln is 4.8 million btu, the equivalent of about 425.0 pounds of coal. Each year, the U.S. cement industry burns the equivalent of about 16.0 million tons of coal. But the industry is increasingly replacing conventional fuels with waste fuels; compared to zero percent in 1972, waste fuels accounted for 7.7 percent in 1992. A study of American cement kilns conducted by the Portland Cement Association (PCA) in 1992 showed that 42.0 percent used fuels derived from tires, waste oil, solvent, almond shells, hazardous wastes, wood chips and other sources.

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Cement Industry

The Portland Cement Association (PCA) has predicted cement consumption will set a new record of 85.3 million tons in 1996. Cement production already is running at 95.0 percent capacity. According to Engineering News-Record (ENR), cement consumption had increased 7.3 percent to 82.2 million tons in 1994.

Concrete contractors are optimistic about a variety of markets with the upturn in the economy and in construction activity. In the concrete renovation market, the volume is increasing, but competition is still keen, with more and more contractors going into this segment of the industry.

According to the National Ready-Mixed Concrete Association, the ready-mixed concrete market totals 250.0 million cubic yards per year. Per capita consumption of concrete is approximately 1 cubic yard. The ready-mixed concrete industry is a very localized industry, dominated by small firms, since there is only a 90-minute period of "perishable time" for use, once the product has been mixed and placed in a truck for delivery.

The farm market uses about 4.0 percent of total ready-mixed concrete, whereas home building uses approximately 40.0 percent. Commercial construction and public works, including paving, consume 40.0 percent and 20.0 percent respectively. Ready-mixed concrete is used primarily in new construction, so the fortunes of ready-mix concrete depend on that market.

Cement quotes currently average $60.00 a ton, but prices vary widely depending on the region of the country, since cement cannot be transported profitably very far over land. Price increases of $3.00 to $6.00 a ton went into effect in several areas, and in most other regions, similar increases have been announced effective April 1, 1996. Prices rose fastest in the Southeastern U.S., and the smallest gains occurred in California. Economic conditions are beginning to improve on the West Coast, the only region that currently has some excess capacity. Since 1992, annual price increases have averaged between $4.00 to $8.00 a ton. Industry analysts expect this pattern will likely continue through 1999 (Value Line, 1/19/96).

Import Market

According to Merrill Lynch analysts, many cement producers spent 1994's "off season" arranging cement imports in sizable quantities. Collectively, these firms committed to import too much, especially with demand growth slowing. Cement imports jumped 51.0 percent during the first half of 1995, and at year's end, were up 39.0 percent, constituting almost 18.0 percent of total supply. Merrill Lynch analysts also note that due to higher cement prices overseas and freight costs, importing cement is a far less profitable activity for domestic suppliers than is the sale of internally-manufactured product.

Merrill Lynch reports that imports are predicted to drop by at least 5.0 percent in 1996, to about 16.0 percent of total supply. The somewhat confusing pattern of 1995 should not obscure the fact that U.S. demand remains far in excess of U.S. supply, and that imports are needed to fill the gap. Merrill Lynch's economic model predicts the cement sector's fundamental pattern tends to lag the overall economy and be noticeably "later in cycle" than is the case with other building products markets that are more housing sensitive. Moreover, the initial phase of the next cyclical decline in cement consumption will come entirely out of imports, leaving the domestic supply/demand pricing equation comparatively healthy, (Merrill Lynch, Cement Industry, 12/29/95).

Mixing Concrete

There are three types of mixing operations as defined by the American Society for Testing and Materials (ASTM).

- Central Mixing. Concrete is mixed in a central plant mixer and delivered to the job in a revolving drum truck, an agitator or nonagitating unit.
- Shrink Mixing. Concrete materials are blended in a central plant mixer with the mixing completed in a revolving drum truck mixer.
- Truck Mixing. Ingredients are loaded into a revolving drum truck mixer for mixing and delivery.

Central Mixing

The choice between central and truck mixing depends on a large number of factors. The technical advantage of central mixing is that it provides centralized control of the mixing process and requires a less-skilled truck mixer operator. However, the Concrete Plant Manufacturers Bureau (CPMB) study of economic factors shows that the decision will depend on a number of other factors, including the market area, market volume, blade life in trucks, and truck utilization. Although there are no recent data on the percentage of the ready mixed concrete produced by central mixing, it is likely that it is in the middle or lower end of the historical range of 20.0 percent to 25.0 percent.

The principal advantages of truck mixing are lower capital investment, lower plant heights, lower electrical costs, and somewhat greater flexibility when long deliveries are required in rural area. With special loading sequences designed to keep cement essentially dry until the concrete is mixed at the job site, loss of slump, and use of retempering water, can be avoided. The importance of the loading sequences is likely much less if, as in most ready mixed concrete operations, the concrete will be transported in a revolving drum truck mixer. Loading sequences to ensure uniform mixing in truck mixers must not attempt to achieve uniform ribbon loading or blending of ingredients.

Although most State Departments of Transportation (DOTs) permit 60 or 90 seconds mixing time in central mixers, ASTM still requires a minimum of 1 minute mixing for the first cubic yard and an additional 15 seconds for each additional cubic yard. This minimum can be reduced if mixing uniformity criteria are met after shorter periods (Ready Mixed Concrete, 1995, National Ready Mixed Concrete Association).

Shrink Mixing

Early in the development of the ready mixed concrete industry, shrink mixing was designed to permit hauling a larger batch in a truck mixer. The idea was to partially mix and shrink the volume of concrete before it was placed in a truck mixer for final mixing. Only a small percentage of producers use the system today.

TRUCK MIXING

Two general types of inclined axis truck mixers in use today are the traditional rear discharge unit, and the newer front discharge unit. Because the front discharge unit requires a special truck chassis, it tends to be a significantly more expensive unit than a rear discharge unit. With a rear discharge unit, the mixer can be more easily positioned on the truck chassis to comply with the truck weight laws of the various states.

Many contractors prefer front discharge units because the truck driver can drive into the job with little direction from contractor personnel, control chute movement, and discharge from within, without leaving the truck cab.

The requirements of ASTM for truck mixers are that the volume of mixed concrete not exceed 63.0 percent of the gross drum volume for truck or central mixed concrete, or 80.0 percent for central mixed concrete.

Front discharge units tend to have much larger gross drum volumes than rear discharge units for two principal reasons. In a quick stop, a front discharge unit is much more likely to spill concrete and the extended cylindrical section over the truck cab tends to be relatively ineffective in mixing concrete. The result is that the manufacturer's rated mixing capacity may be less than half the gross drum volume.

ASTM requires revolution counters on truck mixers and that the mixer be capable of mixing concrete in 70 to 100 revolutions. The limits set for mixing uniformity include tests for: air-free unit weight of concrete, air-free unit weight of mortar, air content, slump, coarse aggregate content, and 7-day compressive strength.

Acceptable performance requires compliance with five of the six tests. Two samples are taken after discharging approximately 15.0 percent to 85.0 percent of the load. For central mixers, the samples can be taken during discharge or directly from the mixer at points approximately equidistant from the front and rear of the load.

Slump test of samples taken after the discharge of 15.0 percent and 85.0 percent of the load can be made as a quick test of the probable degree of mixing uniformity. The specifications also require mixers to be examined or weighed routinely to detect accumulations of hardened concrete.

Generally, it has been found that when blade wear or accumulations of hardened concrete have become significant enough to affect mixing uniformity, discharge performance will also have deteriorated enough to be noticeable, particularly with moderately low slump concrete (Ready Mixed Concrete).