

Automakers Drive Acceptance of Roller-Compacted Concrete

For years, one of the uses of roller-compacted concrete (RCC) has been to create simple, fast and economical pavements for industrial and heavy-duty applications. Placed with conventional asphalt paving equipment and incorporating the same basic materials as regular concrete, RCC pavements create safe, durable surfaces for ports and loading docks, intermodal transit facilities, parking lots, military facilities, and storage yards.

Automakers were first sold on RCC when more than 134 acres of RCC parking areas and access roads were used to construct the General Motors Saturn Plant in Spring Hill, Tenn. (1988-89). Today, auto manufacturers are turning to RCC more than ever. The material's low cost, quick speed of construction over large areas, and ability to stand up to heavy loads has established it as an ideal pavement for these heavy-duty applications.

RCC: A Different Kind of Concrete

While RCC contains the same basic ingredients as conventional concrete—cement, aggregates, and water—it's mixed in a drier form and can be placed with conventional or high-density asphalt paving equipment. RCC is stiff enough to compact by vibratory rollers, and does not require many of the features we associate with concrete: forms, finishing, dowels, or reinforcing steel.

For larger projects, RCC is created by blending materials in a high-capacity mixer located at or near the construction site. Dump trucks deliver the material to high-density asphalt pavers at the job site which place the material in layers up to 10 inches thick and 42 feet wide, covering large spaces at an extremely fast pace. Smaller projects can easily be accommodated by both central mix and dry batch ready-mix plants.

Material is compacted immediately after placement, a continuous process performed until the finished pavement meets density requirements. The pavement is then cured, and in many cases joints are sawed to control cracking.

Why Auto Facilities?

"RCC is perfectly suited for manufacturing plants," says Robert Taylor, Alabama director of the Southeast Chapter of the American Concrete Pavement Association. "Most of the engineers we worked with agreed that they would prefer conventional concrete, but economies drove them to consider using roller-compacted concrete instead. When we educate people on its initial price and its superior performance to asphalt, it's an easy sell."

Contractor Ron Peltz, partner in A.G. Peltz Group, LLC, paved at all three of the Alabama facilities (discussed on the back page). He says owners prioritized speed of construction and strength. "Initially, RCC is much stronger and constructed much faster than conventional concrete," says Peltz. It's an appropriate stand-in for asphalt in auto applications, he adds, "You can't run big forklifts over asphalt and use it as a staging area for construction."

RCC offers four key benefits of use in auto facilities:

Low Cost Economies of scale keep the cost of RCC low: massive amounts of the material can be placed quickly, sometimes as much as 1,000 tons per hour. Because there are no forms or finishing, crews are smaller and less equipment is brought on-site. RCC's high strength eliminates the need for reinforcing steel, further cutting labor and material costs.

High Speed RCC isn't just placed quickly—it's finished quickly, too. It takes less than one hour from the start of mixing until final compaction. In some applications, strengths as high as 5,000 psi are achieved within seven days. In many cases, pavements achieve sufficient strengths to allow most vehicular traffic to use the surfaces almost immediately.

High Strength Finished RCC pavements achieve unconfined compressive strengths between 4,000 and 10,000 psi, which are high enough to withstand concentrated loads and impacts inflicted by industrial applications. At plant sites, RCC pavements can act as staging areas for construction equipment, and then for delivery of extremely heavy manufacturing machinery. High flexural strengths of between 500 and 1,000 psi are typical for most RCC pavement projects. The high strength supports heavy, repetitive loads, eliminating the rutting, shoving, and fatigue cracking associated with asphalt pavements.

Low Maintenance The high density of RCC means minimized voids and greatly reduced water seepage through the pavement, creating excellent durability in even the most aggressive freeze-thaw conditions. High shear strength also helps the pavement resist damage from repetitive use and loads. Sealing of the joints and occasional cracks are the only maintenance typically required.

Case Studies:

Case Study: Honda Home to World's Largest RCC Paving Application

Work on approximately one million square yards of RCC pavement—the world's largest application to date—was completed in January 2004 at Honda's facility in Lincoln, Ala.

"RCC pavement worked so well for Honda because we were there at the start," explains Peltz. "The original design was for asphalt, but early on we were allowed to be part of the decision-making process—so the project was re-designed for RCC," he says. The extremely large size of the project was perfectly suited to the material.

"After performing a design decision analysis between RCC and bituminous paving we determined that the best solution was to substitute RCC paving for virtually all the proposed paving," said Jeffrey Smith, BE&K's lead civil engineer for Honda Manufacturing Alabama. "The capital cost in this particular application provided the client with an estimated initial cost savings of 30% in the overall site-paving package."

In most cases, the pavement achieved 5,000-psi compressive strength and 1,000-psi flexural strength within seven days; in some cases, pavements were strong enough for use within 48 hours. Constructed before most of the facility's buildings, the finished pavement served as staging areas for the heavy-duty equipment used to build the rest of the facility.

Case Study: Hyundai Uses RCC Roads as Staging Areas

A new Hyundai automotive plant in Montgomery, Ala., is also taking advantage of RCC's speed of construction and strength. In July 2004, A.G. Peltz finished installing about 250,000 square yards of RCC pavement at the site. Like Honda, Hyundai is using the RCC roads to stage their plant construction, says Peltz.

"During plant construction, the entrance roads will have a lot of irregular and abnormally heavy wheel loads because of plant equipment coming in," says Taylor. "In any large paving area where you have low speeds and heavy traffic, it makes sense to use RCC."

Case Study: RCC Meets Challenge for Mercedes-Benz

At the Mercedes-Benz production facility in Vance, Ala., RCC was constructed as a replacement pavement for the company's highly-touted first manufacturing site outside of Germany. Early plans to use asphalt were dumped after the company saw the success of RCC at the nearby Honda facility.

Working on the high-profile facility, in less-than-optimal conditions, was tough. "There were all kinds of obstructions in the way, buildings were already in place, and we were fitting big paving equipment in small spaces," says Peltz. Even with these challenges, the finished product is strong, durable and attractive, he says: "Logistically, it was not an easy job, but we still had a good result in the end. The pavement out there is beautiful."

"We chose RCC for our delivery and marshalling areas," says Scott Hazen, facility civil engineer for Mercedes-Benz. "RCC is not new for Mercedes-Benz—in Germany its has been used for paving and floor slabs as well. Mercedes will definitely consider RCC on future projects."

For more information on roller-compacted concrete—including more case studies, suggested specifications, and technical support—visit the PCA Web site at www.cement.org/pavements.



Asphalt type paving equipment is used to place RCC pavement at the Hyundai auto manufacturing facility in Montgomery, Ala.

At the Mercedes-Benz auto plant in Vance, Ala., a pavement engineer measures the depth of the placed RCC.



Approximately one million square yards of RCC pavement was placed at the Honda plant in Lincoln, Ala.

PCA

Portland Cement Association

5420 Old Orchard Road
Skokie, Illinois 60077-1083
847.966.6200 Fax 847.966.9781
www.cement.org

An organization of cement companies to improve and extend the uses of portland cement and concrete through market development, engineering, research, education, and public affairs work.