

GLOBAL PARTNERSHIP MARKETS NEW CLAY FROM THE BRAZILIAN JUNGLE

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RIO CAPIM CAULIM KAOLIN A NEAR EQUAL TO CALCIUM CARBONATE.

BELOW THE TALL TREES OF NORTHERN BRAZIL, BELOW the ant nests and roots, a unique kaolin deposit was discovered in 1974.

Mendes Junior Industrial Group, Brazil's largest heavy construction company at the time, conducted the initial exploration of the site and feasibility studies and was awarded a 10,000-hectare mining concession in the mid-1970s. However, the world market and lack of infrastructure didn't favor immediate development of the site. The project was shelved until 1989. A quick reappraisal of the project showed good prospects for the market, the infrastructure was better developed, and the clay tested well in pilot tests.

Mendes Junior decided to go ahead with the kaolin project, but realized that it would need partners to both help with financing and provide expertise on kaolin and the coating market. Germany's Amberger Kaolinwerke Eduard Kick GmbH was the first to sign up, joined later by Dry Branch Kaolin of the United States and Sumitomo Corporation of Japan. The three now own 34%, 44% and 5% respectively, with Mendes Junior retaining a 17% interest in the operations.

The mine itself lies 140 km south of Belém. Operations began there in the summer of 1996. The first shipment of processed kaolin was delivered to Europe in September of 1996.

Although other kaolin deposits in the region are held by the Brazilian government and Pará Pigments S.A. (PPSA), the kaolin deposit being mined by RCC is one-of-a-kind. It is a secondary deposit formed by the decomposition of granite and metamorphic rock. The aluminum-rich particles that settled downstream were later covered by other minerals. Organic acids from the rain forest that finally covered the area leached the reactive minerals and organic material out of the kaolin.

The crude kaolin has about one-third the ferro-titanate impurities as clay mined in the United States, notes Bill Atherton, senior research scientist for Dry Branch Kaolin. The low iron content means the clay has more of a blue-white color.

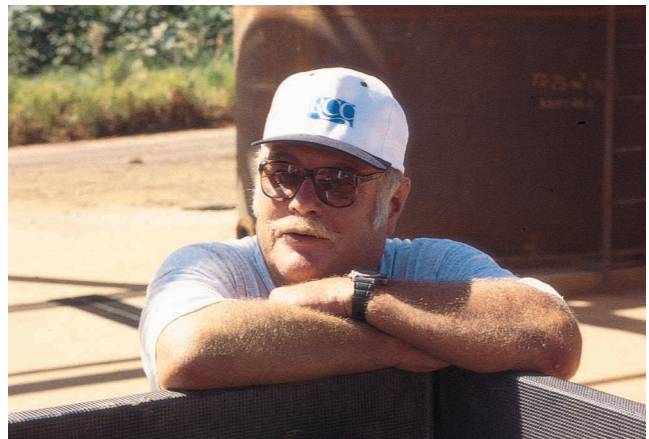
All-in-all, kaolin from the deposit is easy to mine and easy to process. The overburden or top layer of soil and dirt is only 10-5 m deep. The usable kaolin extends another 5-8 m below that. About 10% to 15% of the material dug from



The rain forest of northern Brazil



RCC's kaolin mine



Klaus Mangold, the mine manager



The mining operations



Loading crude kaolin onto a barge

the open mine is sand. That's less than average for Georgia mines and much less than usual for English clay sites.

The profile of the deposit varies somewhat from top to bottom. The closer to the top, the finer the particles. The closer to the bottom, the brighter the particle, and the more sand. To help maintain a certain consistency, the mine works two different levels or benches and combines the kaolin it digs from the earth.

The mine works one long strip of the deposit at a time. Each cut is 70 m wide. The mine is currently working the second cut, which should be completed by July 1998. Extraneous material cleared from each successive cut is used to reclaim the previous cut.

Rio Capim Caulim worked closely with the Brazilian Institute for the Environment and Renewable Resources (IBAMA) to develop a mining and reclamation program for the site. "The program includes annual limits on cutting, provisions for reforestation with species native to the area, and the development of an ecological preserve," the company notes. Also, RCC maintains its own nursery with 30 varieties of trees. Workers replant trees at 5-m intervals on the restored cuts.

Kaolin from the exposed deposit is scooped from the earth and loaded into trucks, hauled down a firmly packed dirt road that also serves as a landing strip, then dumped on river barges for transport to the processing plant. It takes 96 hours to complete the round trip by barge.

Additional equipment was being installed at the mine this summer to allow kaolin to be pumped to the barges and transported as a slurry.

THE PROCESSING PLANT

The RCC processing plant and shipping port lies to the southwest of Belém, near the Atlantic coast of Brazil's Amazon Basin. Belém, named after the site near Lisbon where the Portuguese explorers set sail on their voyages of discovery, dates back to 1616. It is the capital and commercial center of Pará state and home to about 1.3 million people.

Commercial flights make regular stops in Belém. To get to the RCC plant requires a trip across town to one of the city's many wharves. There you catch a boat across the swiftly flowing Rio Guama and across the calmer Rio



The mine's nursery grows a variety of native trees for replanting.



A sculpture made from RCC kaolin



Afonso Guerra and Milton Costantin

Acará to the Rio Pará side for the half-hour drive to Barcarena and on to the plant at Murucupi village.

Afonso Guerra serves as RCC's director and president at the greenfield plant. Milton Carlos Costantin is RCC's director of operations.

Rio Capim Caulim produces two forms of kaolin: Capim DG and Capim NP. The DG is composed of free single particles processed directly from the centrifuge. The NP is delaminated clay produced from kaolin particle stacks or booklets. Both have a GE brightness of 90+. The clay is available in spray-dried (bulk and semi-bulk bags) and in slurry.

The kaolin differs structurally from those found elsewhere in the world. The crystals are large and well-

shaped, providing good coating coverage. It has fewer ultra-fine particles, so that it can reduce binder demand. The clay's rheology and viscosity are very low. According to William C. Atherton, Senior research scientist for Dry Branch Kaolin, the rheology of coating formulations made with the RCC clays compare favorably with those using fine ground calcium carbonate.** Mills have also been able to coat at about 2% higher solids, with improved runnability, using the Rio Capim clay, according to Costantin.

Crude kaolin is brought by barge to RCC's docks, located about a mile from the plant. The processing plant maintains a stockpile of 100,000–150,000 tons of crude kaolin, enough to last for 2–3 months.

The first step in processing the kaolin is blunging, in which the crude material is mixed with water and chemicals to form a slurry at a rate of 120 tons/h. Sand and some other impurities are settled out during an initial purification stage and then fine particles are separated from coarse particles in the centrifugal classifiers.

A cryogenic magnet, chilled to -269° C, removes iron particles from the kaolin a batch at a time, at a rate of 500–600 kg/min or about 35 tons/hour. Rio Capim Caulim further whitens the clay with a mixture of sulfuric acid, sodium hydrosulfide, and aluminum sulfide (alum).

A "home-made" process control system, developed and maintained on site, keeps track of flow rates throughout the process. The processed slurry can be thickened through spray drying.

**(Note: The full text of Bill Atherton's paper, "Performance of Brazilian clay in coated paper," was published in the 1997 TAPPI Coating Conference Proceedings, pp. 43–72, TAPPI PRESS, Atlanta, and can be found as part of the TAPPI JOURNAL material for November on TAPPI's web site at <http://www.tappi.org>.)



A bulldozer moves raw kaolin from storage to the blunger.

The plant operates around the clock with about 116 people working 8-hour shifts. The plant was installing additional filters and grinders during the summer to increase its filtering capacity by about 30%.

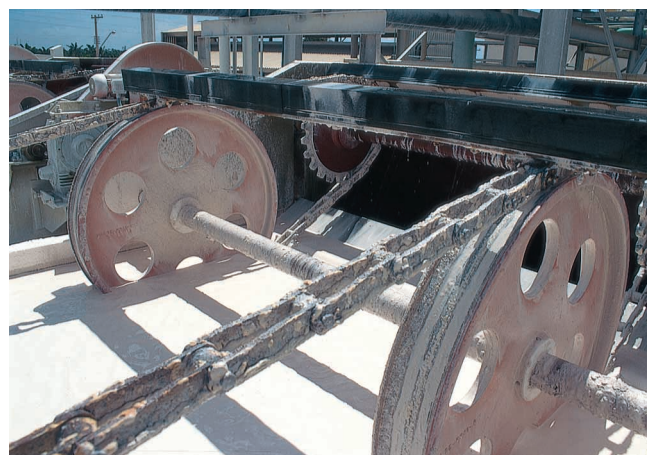
The plant is working toward ISO 9000 certification, which it hopes to receive early next year. The company has been concerned with quality from the start, and the plant is under strict instructions not to ship any product unless it meets specifications. Basic tests of the raw kaolin are conducted at the mine. More extensive and sophisticated tests of the finished product are carried out at the processing plant, which is also equipped to run basic performance trials. Further quality checks, tests, and product development are conducted at Dry Branch in Georgia, and round-robin tests are regularly conducted at each of the partners' labs.

All of the processed clay is shipped from RCC's port facility. The facility has six 5500-metric-ton silos for dry storage and two 5000-metric-ton slurry tanks. An 800-m pier juts out from the storage area to a deep-water loading dock designed to accommodate 45,000-ton cargo ships. **TJ**

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RCC's kaolin processing plant



Sediment is removed from the initial slurry.



RCC's cryogenic electromagnet removes iron particles from the clay