

ORIGNY AT ROCHEFORT

- EC** We visited the unusual Ciments d'Origny plant at Rochefort. The process is unique in France, as it uses a pyrolysis system to separate 'machining waste' (*boues d'usinage*) into both fuel and raw materials, allowing their injection at separate points in the clinker production process. We also talked to Philippe Arto, Origny's general manger for the French market.
- EC** Wir besuchten das 'ungewöhnliche' Werk Ciments d'Origny im französischen Rochefort. Das dort eingesetzte Verarbeitungsverfahren ist einzigartig in Frankreich. Ein Pyrolysesystem trennt 'Abfallprodukte der Verarbeitung' (*boues d'usinage*) in Brennstoffe und Rohstoffe und ermöglicht so deren Einspritzung zu verschiedenen Zeitpunkten der Zementklinkerherstellung. Wir sprachen auch mit Philippe Arto, Orignys Geschäftsführer für den französischen Markt.
- EC** Nous avons visité l'usine inhabituelle des Ciments d'Origny à Rochefort. Le procédé est unique en France : il utilise un système de pyrolyse pour diviser les boues d'usinage en carburant et en matières premières, ce qui permet de les injecter en des points différents du processus de fabrication du clinker. Nous avons aussi rencontré Philippe Arto, directeur général d'Origny pour le marché français.

The Jura region around Rochefort-sur-Nenon is a particularly lovely part of France. The rolling fields of wheat, corn and sunflowers ripen early because of the warm summers. Medieval villages dot the landscape, with the charming town of Dole at its centre. So charming is the town that France's minister of the environment lives there, just 5km away from Ciments d'Origny's

Rochefort-sur-Nenon cement plant. Some cement plant managers around Europe would have sleepless nights if a minister like her lived in such proximity to their facilities. But Jean-Pierre Depres, Rochefort's manager, seems to sleep pretty well. He can afford to, as the plant has the latest environmental monitoring equipment. He also presides over the only pyrolysis plant in the French cement

industry, which allows the use of not just alternative fuels, but alternative raw materials.

The basics

Rochefort has a 0.45Mt semi-dry Lepol kiln and can produce up to 0.5Mt of cement. It was the last turnkey cement plant to be built in France (it started life as Ciments de Champagnole in 1972, but merged with Ciments d'Origny in 1989). It was built to provide CEM I cement to the Paris market. The majority of its production goes to the Bourgogne ready mixed concrete market. The plant also produces CEM II cement, which is



Left: The Pyrolysis unit at Rochefort-sur-Nenon, designed and built by Nesa of Belgium. Behind it is seen the main building, with cladding designed by the architect Thierry Bogaert. Computer simulations helped to guide the choice of colours, designed to blend the building into the sky.

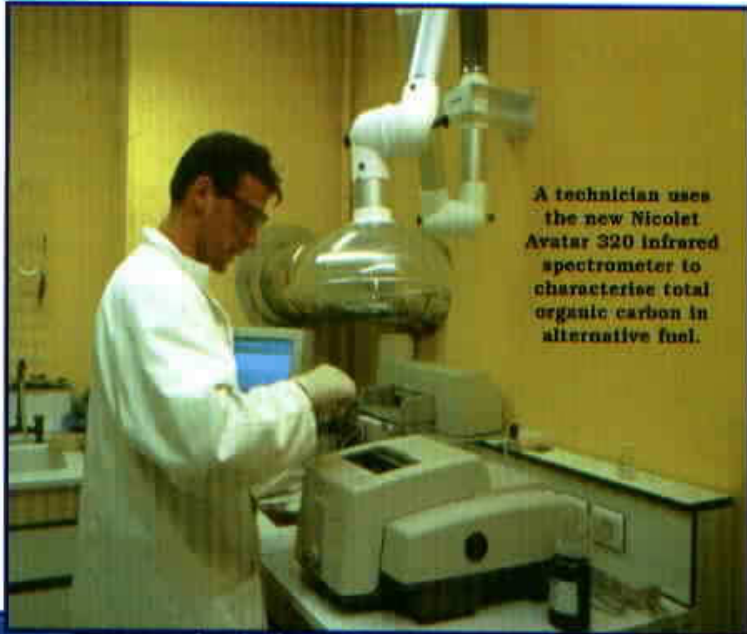
All photos: Guy Werner

sent to builders merchants. Because of the excellent state of the French market at the moment, the plant is running at 98% capacity.

Raw materials

The quarry is situated next to the plant, and contains 100 years-worth of Jurassic limestone and marl. Böhler, Euclid, Caterpillar, O&K and Michigan equipment is used to feed the 600t/hr primary crusher, connected to the plant by a short belt-conveyor. The floor of the quarry is 3m above the water table - raw materials could be extracted below this level, but they would be too damp to use.

But the quarry is not the only source of raw materials. Around 80% of the gypsum used is artificial, the rest coming from Switzerland. And in terms of clinker ingre-



A technician uses the new Nicolet Avatar 320 infrared spectrometer to characterise total organic carbon in alternative fuel.



Left: The AAF bag filter units seem to be doing a highly efficient job. Below: a new screening unit for the boues d'usage.

dients, the plant uses up to 8% alternative materials. Around 2% of the total is made up of foundry sand, and 3% is waste rock wool. The balance is made up of a fascinating material, known in French as *boues d'usinage*: in English it would be known as machining waste.

Pyrolysis

When metal is machined or lathed, the oil-soaked burrs and powders which result are difficult to dispose of. It is sticky, and prone to spontaneous combustion through the oxidation of metal and ignition of the hydrocarbons. Ciments d'Origny has built a special pyrolysis unit at Rochefort to treat the machining waste, allowing it to be converted into both raw material and fuel.

The unit, built and designed by Nesa of Belgium, is fair-





ly compact, measuring 7m wide and 12m high. It has a rotating vertical shaft in the middle with arms designed to provide mechanical agitation to the powdered waste. This is first disaggregated by a G+A screen, then delivered into the pyrolysis unit by chain conveyor from a Sofraden-designed storage area. The waste is heated to around 700°C, volatilising the hydrocarbons coating the metallic particles. The hydrocarbon vapours are flushed from the system at 400°C, and burned in the main kiln burner. The metallic powders are extracted from the bottom of the unit and added to the kiln feed as an alternative raw material. The highest temperature allowable for the exit vapours is 450°C, constrained by the mechanics of the conveying fan. The gases cannot go below 390°C, otherwise they would condense in the conveying lines.

The unit can process up to 6t/hr of waste, resulting in 3.6t of FeO-rich powder, 1.2t of water vapour and 1.2t of hydrocarbon vapour.

Fuel and emissions analysis

A whole gamut of alternative fuels are used at Rochefort - including hydrocarbon vapour from pyrolysis, waste oils, chipped tyres, solvent-contaminated water and crushed photocopier cartridges. The difficult and different

mechanical properties of these materials means that the plant uses a Cardox unblocking system. All of the wastes have to be certified before use, hence the Rochefort plant has sophisticated analytical facilities.

An inductively-couple plasma atomic absorption spectrometer is used to measure heavy metals, P and S in all of the fuels. PCB concentrations in solvents, oils and raw material replacements are measured using a Varian Star 3400 gas chromatograph. And a brand-new Avatar infrared spectrometer by Nicolet is used for the characterisation of the organic carbon constituents of the fuel. Finally, a Janke & Kunkel IKA calorimeter is used to measure energy content of the fuels.

Emissions are monitored continuously by a system installed by Opsis of Sweden. It records concentrations of CO, CO₂, NO_x, NO₂, SO₂, HCl, H₂O, CH₄ and total hydrocarbons every three minutes. A summary is produced every 30 minutes and a report is sent to the authorities each month. Although the limit for dust emissions at this plant is legally 35mg/Nm³, the plant tries to keep it below 10mg/Nm³. The American Air Filtration bag filter seems to be effective, as it can be as low as 1mg/Nm³. The plant is unusual in that it filters air even during the start-ups.

Local reaction

EC asked the director about the reaction of local people to the use of alternative fuels and materials. Jean-Pierre Depres replied that

Left: Kiln scanner records are kept assiduously. On the right is the Opsis reporting system, monitoring a wide variety of gaseous emissions from the plant.



The new Fe-waste store, built by Beechard of Breucourt in France.

"The people here are very environmental, but without negativity - they are realists. They want to preserve the area."

"They said that they would prefer us to use the waste, rather than it be dumped," said Depres. "They are a little upset about the extraction of raw material from the quarry, so they think it is positive to use alternative raw materials."

Depres explained that the company is in contact with environmental groups, but specifically with the technically-minded individuals within those groups. "We are simple and transparent with them," he said, adding that environmental organisations trusted the factory's sensors. A bewildering array of associations are interested in the running of the plant, including the Jura Nature Environment, Dole Environment, ASQUAB and FOC. Despite this, and the proximity of the minister for the environment, the Rochefort-sur-Nenon plant manager can sleep soundly tonight.

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