

“Mature achievement – not only on paper”

## Germany – Mainz-Kostheim, SCA Paper Factory

Project Development



### The Task

**Production of foundation piles for the extension of a paper factory over an area of approx. 300 x 75 m.**

### The Challenge

- **Bearing of rated loads up to 3000 KN in strongly malleable, clayey soils**
- **Penetration of remains of building rubble as well as marly and limestone shelves**
- **Implementation of approx. 450 drilled piles, diameter 880 mm, (corresponding to approx. 10,500 drilling meters) in only 2 (!) months**

### The Subsoil

Beneath a non-homogeneous backfill layer up to 2.5 m thick is a layer of alluvial loam in some areas. Thereafter will be found a succession of quarternary sands and gravels up to 6 m below the site. Pile loads bearing will take place in the tertiary layers lying

below, which are essentially characterised by marly clays, clayey marl and marl. Stabilising elements in the form of marly and limestone shelves are enclosed in this layer.

## The Implementation

In order to meet the demanding requirements of the building site and the building schedule, the double rotary drilling method was chosen. The implementation planning and statics were drawn up as a special proposal for the special engineering company commissioned, presented to the testing engineer and agreed with him.

The double rotary drilling method is the combination of a continuous flight auger drilling and a casing. During the drilling the casing and the continuous flight auger move in counter-rotation. The casing ensures that the surrounding soil is supported, and the continuous flight auger transports the soil within the casing continuously upwards. After the required drilling depth has been reached, concrete is injected through the hollow stem of the auger using a concrete pump. By pulling simultaneously the outer casing and the auger which is filled with drilling debris, concrete can continue to be pumped in. Then a reinforcement cage can be put into the still fresh concrete.

The main advantages of the double rotary drilling method compared with the Kelly drilling method lie in a considerably improved performance, greater drilling precision through the counter-rotation of the drilling tools, reduced noise exposure, a high

degree of work safety and especially a greater axial load capacity of the piles. Comparative studies of both methods in non-cohesive soils proved an increased load capability of up to 50 % using the double rotary drilling method.

To also prove the process-related load capacity increase in the cohesive soil layers on the Mainz site – and to take it into account during the static survey –, four test piles were produced before the project was started. Under specialist supervision load capacity tests were carried out, using the CAPWAP procedure. The test results led to a saving of pile length of approx. 15 percent. In connection with the selected drilling diameter of 813 mm a saving of approx. 25 percent of the volume of concrete compared with a calculation based on the “empirical values” according to DIN 1054:2005-01 (now: EA piles) was confirmed.

The penetration of the enclosed marl and limestone shelves as well as the infill of existing building rubble was carried out without difficulties. The double rotary drilling unit achieved an average daily production of 270 m. Not only the rapid construction progress but also the high quality of the implementation convinced both client and building contractor.

