

## Key stages in cement production

Cement production is one of the world's most energy intensive industries. Key production stages can be summarized as:

### 1. Raw materials

These are generally combinations of limestone, shells or chalk, and shale, clay, sand or iron ore, usually mined from a quarry close to the plant where they undergo reduction using primary and secondary crushers. When the reduced materials reach the cement plant they are proportioned to create a cement of specific chemical composition. Much work is being done on the use of alternative raw materials – often the by-products of other industrial processes. These can minimize the effects of quarrying, reduce the impact of the cement plant on the local environment and enable the cement industry to become a major player in materials recycling.

There are two basic methods used in Portland cement production – wet and dry. In the dry process dry materials are proportioned, ground to a powder, blended and fed into the kiln dry. The wet process involves adding water to the proportioned raw materials and completing the grinding and blending operations in slurry form.

### 2. Pre-heater

To conserve energy, most modern cement plants pre-heat raw materials before they enter the kiln, using the hot exhaust gases from the kiln itself.

### 3. Kiln

The mixture of raw materials is fed into the upper end of a rotating, cylindrical kiln, which achieves temperatures in excess of 1000°C. It passes through at a rate controlled by the slope and rotational speed of the kiln. Chemical reaction inside the kiln leads to the fusion of the raw materials to produce clinker. Traditionally kiln fuels have been powdered coal or natural gas, but increasingly alternative fuels are being used. These include materials such as scrap tyres, processed sewage sludge and packaging waste.

### 4. Cooling/finish grinding

Clinker is discharged from the lower end of the kiln and transferred to various types of coolers. Cooled clinker is combined with gypsum and ground to a fine powder in a ballmill to produce the final grade cement.

