EXCURSION

Dorket Head Brickworks

Leaders: Keith Ambrose and Greg Kingston

Wednesday 16th July 2014

Dorket Head Brickworks, near Arnold, is a part of Ibstock Brick Limited, and quarrying of clay started here in the 1860s. Current estimates suggest a future life in excess of 25 years for the available reserves, making around 180 years of brick making. It is one of several brickworks in the East Midlands, with many of the others being in Leicestershire. All of these pits work the Mercia Mudstone Group, which provides a good mix of clay, silt and sand. The quartz grains in the siltstones and sandstones are necessary to prevent excessive shrinking during firing. The mineral dolomite, also commonly present in the Mercia Mudstone, has the effect of producing paler bricks.

The blending of different clays, and importing of other materials such as fireclay, anthracite and chalk, produces bricks with different properties and colours. Dorkett Head works the Gunthorpe Member of the Sidmouth Mudstone Formation, but many of the Leicestershire pits work the lower Tarporley Siltstone Formation. That part of the sequence is notable for its coarser sandstones and mica content. The presence of mica contributes favourably to the process of vitrification (the transformation of a substance into glass) that produces a glassy bond to give the bricks strength. However, the Gunthorpe Member is not noted for its mica content, although some of the green siltstone beds contain a little mica. No mica is added to the Dorkett Head bricks.

The quarry is only worked for 6 weeks each year in July and August, when a stockpile is built up in the quarry by excavator and dump truck. This is then worked throughout the year, with clay transported to the factory via a conveyor belt.

The annular chamber kiln at the Dorket Head brick factory as it was in the 1950s.

Moulded clay extruded as a single strip prior to cutting into brick-sized blocks ready for to go into the kiln.

The brick-making process

Clay is mixed with 1.3% coal to make the bricks resistant to frosts. A mixture of Welsh anthracite and imported Polish coal is used. Clay comes in from the stockpile, and primary crushing reduces it to a particle size of 25 mm. The coal is then added. Further crushing through rollers, takes the size down to 4 mm, and then finally to 1.2 mm. Bricks require a moisture content of 15% for the forming process, so water is added during primary crushing and extrusion stages. To make a brick, the process can manage with as little as 8% clay mineral content, whereas bone china needs 98.5% clay.

About 90 tonnes of rock per hour are used in the process. Crushed clay goes through a screen feeder and the process divides into two forming lines, with the clay being pushed into a de-airing chamber and squeezed out in the shape of a brick, rolled for a pattern and blasted with sand. Holes in the brick are formed at this extrusion stage. Bricks are blasted with a gold or red stained sand mixture to provide a texture on their outside. This is then rolled to create a pattern. The gold colouring includes limestone, and five sorts of sand are used. Dorket Head currently produce 24 different types of brick. The extruded strips are then cut by wires into blocks of 24 bricks by wires. The wires are changed around three times a day.

The interior of the modern factory at the Dorket Head brickworks, with completed bricks on the right.

Earth-scrapers and bulldozers used to recover a new stockpile of the Mercia Mudstone during the short summer phase of extraction at the Dorket Head quarry.

The bricks are then split up and dried at 130°C for two days, using excess heat from the kiln. They come out of the dryer and are loaded onto kiln cars, each one holding over 20,000 bricks and taking about an hour to load. Bricks are restacked on the kiln cars in layers two bricks high, with each layer turned through 90° from the one below. The bricks on one kiln car will build around three detached houses. There are a total of 38 cars operating in the plant, of which 23 are in the kiln at any one time. Each kiln car is built of steel with a basal lining of refractory bricks.

Over the years the site has been redeveloped a number of times taking it from an annular chamber kiln to four small tunnel kilns and on to today's high-efficiency tunnel kiln. The site is automated in all of its major processes and operates day and night. Upwards of 80 million bricks are produced in a year.

The kiln is run from injected gas and burns at around 1030°C. The current kiln, originally built in 1996, has seen redesign and investment to expand output levels to today's figure. Cars take two days to go through the kiln. The bricks must reach a temperature of 575°C, the vitrification line, before spending 6 hours at the maximum temperature. This produces a lot of excess heat, most of which is used to dry the bricks and pre-heat the bricks in the kiln. The kiln is in continuous use because it takes a long time to cool and restart without damaging the refractory linings that keep most of the heat in. Burning the clay produces by-product gas that includes SO_2, NO_2 and HF. This is sent through a scrubber of limestone that cleans the emissions. The fluorine comes from decomposition and chemical changes of the clay mix during firing.

On exit from the kiln, the bricks are warm to the touch. They are left to cool then inspected and sorted to the appropriate quality grade. They are then packed and wrapped with each pack containing 475 bricks, and stored in the yard. In spite of an apparent large quantity of bricks in the yard, production output is tailored to meet customers' schedules and stock is cycled frequently. The site supplies many of the larger building firms, who place very large orders each year with call-offs dependant on housing markets.

Dorket Head Quarry

In the quarry at Dorkett Head, the exposures are currently not particularly good, but the face does reveal the typical red-brown, blocky mudstones and the common thin beds of green siltstone. The sedimentary structures that are commonly developed in the green siltstone beds can probably not be seen in the face, but are often findable among blocks that lie in a storage area. Ripple marks, both assymetrical current ripples and symmetrical wave ripples, are common. There are some salt pseudomorphs and raindrop prints, but these are not common. Other sedimentary structures common to the Mercia Mudstone are cross laminations and desiccation cracks, and these may also be visible on the loose blocks. (Notes on the Mercia Mudstone Group, and some useful literature, are included in the report on the Nottingham excursion in this issue of Mercian Geologist.)

Grateful thanks go to Greg Kingston and Damian Waghorn of Ibstock Brick for allowing the Society's visit to the factory and quarry.