GEOLOGY

Early formation of rock salt.

Salt at Winsford was formed some 220 million years ago during the Triassic geological period. At this time the United Kingdom was still attached to Europe, and central England consisted of a series of inland seas that were regularly replenished by the surrounding seas. The combination of the inland seas and the desert environment led to slow evaporation over many millions of years, resulting in the formation of the salt beds which lie under Cheshire and the surrounding areas. During this process, substantial quantities of sand blew in from eastern deserts, helping to create the pink tinge by which Winsford rock salt is recognisable today.

Although the original salt bed is now fragmented, it can be traced from its starting position in Carrick Fergus, Northern Ireland, from where it dips below the Irish Sea before reappearing around central England to then dip under the North Sea. The final part of the salt bed lies across Europe and, in fact, Scandinavia is the only European country without its own natural salt supply.

Winsford's rock formation.

The final rock formation at Winsford has four distinct rock salt seams or 'halite' as it is known (halite is taken from the Greek word 'hals', meaning salt). Each rock salt seam averages 25 metres (80ft) in thickness.

The remaining strata consist of rock salt with Keuper Marl bands and Keuper Marl (see diagram). The youngest of the Triassic rocks in the series, Keuper Marl is usually amber or brown in colour, although on occasions it can be blue or green. Due to many of the influencing geological aspects, the colour of Winsford's salt varies greatly – it can range from clear to pink through to dark brown, although a mixture of dark brown and pink is most commonly found.

Whilst Marl is impervious over time water has penetrated the exposed salt beds, dissolving the salt and creating a' wet rock head' above the Mine. This resulted in wild brine springs presenting themselves on the surface, and it is this brine source that was used for white salt production during the 19th and early 20th Century. The overuse of wild brine springs led to subsidence in many of the local areas over the years, with the result that wild brine pumping is now prohibited and has been replaced with a controlled method of brine removal using boreholes known as 'solution mining'.

The effect of Winsford's geology on its mining operations.

The beds of salt worked at Winsford are relatively flat (see diagram). There are two economically workable beds of salt known locally as Zone 'B' and Zone'F'. These beds lie between 130 and 220 metres below the surface. As discussed earlier the bed is, on average, 25 metres thick but the purest salt is located in the lower part of the bed.

To access the working areas in the Mine it is necessary to navigate through 'folds' in the rock. A 'fold' is the result of ground pressure forcing the rock to bend up or down and, if there is enough pressure, the plastic properties of rock salt and the denser surrounding rocks can force the fold to the surface where it manifests itself as a salt dome. Examples of this can be found in South America and the North Sea. Whilst there was insufficient pressure for a salt dome to form in the Cheshire salt beds, at Winsford we do have a series of monoclinal folds running in the east to west direction.

The Mine is also dictated by another geological feature - 'faults'. Faults are again caused by pressure but, unlike folds, the pressure build-up becomes too great and causes the bed to break away. During this period the bed may rise or fall as a result of the break away. At Winsford the Mine is bounded by two major downthrow faults on the east and west. These are known to be 'competent', which means that the break in the rock has not created a pathway for water or posed any other threats to the Mine's stability. However, despite our favourable geology, we do not mine beyond the fault lines.

Due to the folds and fault lines present at Winsford, careful exploration for future workings must be taken. Rotary-drilled boreholes from the surface are made every 500 metres or more frequently if a fold is detected. Horizontal and vertical boreholes are also taken at intervals from the faceline in order to confirm the location of the working horizon within the bed, and these investigations are supported through the use of seismic surveys.