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Ancient Monuments Laboratory
Report 97/91

IDENTIFICATION OF THE SLAGS FROM SNETTISHAM, NORFOLK.

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Summary

Roman smelting and smithing slags were recovered from the site and from fieldwalking. The distribution of the smelting slag clearly demonstrated that the focus of activity was to the west of the area excavated. There was only a background level of smithing debris recovered, but the presence of a smelting operation would require primary smithing to be carried out.

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Report on the Classification and Distribution of the Slags Recovered from the Snettisham By-pass Excavation, Norfolk.

By Dr Gerry McDonnell

1 Introduction

The new road by-passed Snettisham on the west side, and ran along the valley of the River Ingol. Geologically the the valley floor comprises of greensand overlying boulder clay, bordering on fenland to the west and rising to chalk hills to the east and north. There are no deposits of iron ore in the vicinity, although bog ores may have formed in the wetter fenland margins. Norfolk carrstone is a viable iron ore but it is not exposed in this area.

Fieldwalking prior to excavation and afterwards had shown that there were extensive spreads of occupation through which the road would cut. Ironworking slag was recovered during fieldwalking. Excavations in advance of the construction of the by-pass revealed continuous occupation from the Neolithic to the Roman period. Pits, linear ditches, and enclosure ditches were excavated. The ironworking slags and other residues found in the course of these excavations were examined at the Unit headquarters at Gressenhall.

2 Slag Classification

The slags were visually examined and the classification is based solely on morphology. In general they are divided into two broad groups. First are the diagnostic slags which can be attributed to a particular industrial process; these comprise the ironworking slags, i.e. smelting and smithing slags. The second group, the non-diagnostic slags, could have been generated by a number of different processes but show no diagnostic characteristic that can identify the process. In many cases the non-diagnostic residues, e.g. hearth or furnace lining, may be ascribed to a particular process through archaeological association.

The residue classifications are defined below.

2.1 Diagnostic Ferrous Slags and Residues

Smelting Tap Slag (TAP) - iron silicate slag generated by the smelting process, i.e. the extraction of the metal from the ore. Tap slag is one of the most characteristic forms and is distinguished by the ropey morphology of the upper cooling surface. The Snettisham tap slag was typical and the majority was readily distinguished from the smithing slags. The slag ranged in size from fragments <50mm maximum dimension to fist-sized lumps <100mm maximum dimension, with a few very large lumps weighing in excess of 200gms. Examples of 'slag feeders' were identified, e.g. Contexts 634 and 680. These are believed to be runs of slag flowing from the tap hole that

have frozen in-situ, thus reflecting the size of the tap hole. The best example (Context 418) had a mouth (ie the tap hole) 50mm across, which narrowed to a mean diameter of circa 30mm. The length of the runner was 100mm.

Furnace Slag - this smelting slag is characterised by its viscous appearance (compared with the relative free flowing morphology of smelting tap slags), and the presence of large charcoal impressions (approximately 25mm in square section and at least 30mm long). There were only a few examples of this slag type in Context 445 and it is therefore classed with he tap slag.

Smithing Slag (SSL) - randomly shaped pieces of iron silicate slag generated by the smithing process. In general slag is described as smithing slag unless there is good evidence to indicate that it derived from the smelting process. Hence, in a mixed assemblage of smithing and smelting slags which is present at Snettisham, any slag that cannot be positively identified as smelting slag was listed as smithing slag (SSL).

Hearth Bottom (HB) - a plano-convex accumulation of iron silicate slag formed in the smithing hearth. Only one example was present (Context 2083).

Cinder (CIN) - high silica-content smithing slag, often formed at the reaction zone between the smithing slag and the hearth lining.

2.2 Non-Diagnostic Slags and Residues

Hearth Lining (HL) - the clay lining of an industrial hearth, furnace or kiln that has a vitrified or slag-attacked face. It is not possible to distinguish between furnace and hearth lining. Many of the lining fragments were attacked by slag and some were grey in colour. One example (Context 634) was sub-rectangular in plan, about 100mm by 80mm with a slight curvature. The maximum thickness was about 20mm. It is probable that much of this lining derived from the smelting furnaces, and the shape of this piece would suggest that the furnace was not circular in plan, but curved, similar to the furnaces from Laxton, Northamptonshire (D. Jackson 1988).

Cinder (CIN) - high silica-content slag that can either be formed as described above or by high temperature reaction between silica and ferruginous material. It can be considered either a non-diagnostic slag or a diagnostic slag depending on its iron content and morphology.

Other Material (OTHER) comprised possible ore fragments, ferruginous concretions (probably naturally formed iron rich precipitates, although they may have formed after the archaeological deposits), and fragments of fired clay.

3 Distribution of the Slag

The slag recovered by detailed excavation, watching brief and field walking is listed in Appendix 1 by context number. Most of the diagnostic ironworking slag was identified as smelting slag, (total weight=27.6kg) and therefore the distribution of this material may indicate the area(s) of iron smelting activity. The listing shows that slag (diagnostic and non-diagnostic) was recovered from 75 contexts along the whole length of the excavation. Only a few contained a weight of slag greater than 1kg. This figure is taken as indicative of quantities of slag that are above background levels. The greatest quantities of slag were recovered from unstratified layers, for example plough soil and cleaning layers (Contexts 17, 106 etc). The largest stratified deposits of slag occurred in the largest features, notably a well (F710, Contexts 634, 657, 673, 678, 679, 680, and 690) which contained 6.2kg of smelting tap slag. The smelting slag is therefore thinly distributed over large areas of the excavation.

The distribution of the hearth lining reflected that of the smelting slag so it is probable that it is furnace lining, which would indicate that the smelting area is close to the area of excavation.

The quantities of smithing slag, cinder and other material are background levels only.

4 Discussion

The distribution of the slag in excavated features showed no concentrations pointing to areas of smelting activity. The occurrence of large deposits in the plough soil and in large features suggests that the slag has spread from an ironworking area close to the area of excavation. This has been supported by further fieldwalking evidence.

The slag is typical tap smelting slag, which is common in the Roman Period. The tap smelting technology utilises a shaft furnace up to two metres tall and with an internal diameter of between 0.3 - 0.5 metres. These furnaces were either built into a low bank or had solid platforms of clay or packed stone, e.g. chalk, around the furnace base. Well preserved examples of tap smelting shaft furnaces have been excavated at Ashwicken, Norfolk (Tylecote and Owles 1960). The presence of a piece of probable furnace lining which was only slightly curved does suggest the presence of furnace types other than shaft furnaces.

5 Conclusions

The evidence recovered from excavation and fieldwalking indicates that there was Roman iron smelting close to the line of the present day Snettisham by-pass. It is possible that the activity could be earlier and the slag occurring in the Roman contexts is residual. The scale of the activity can not

be determined, i.e. there is insufficient evidence to suggest whether there were just a few smelting operations to satisfy immediate needs or whether there was industrial activity, albeit on a minor scale. The slag is typical iron smelting tap slag with some furnace slag present. A geophysical survey of the areas adjacent to the new road would probably locate the smelting area and indicate whether any furnace remains still exist.

References

Jackson, D (1988) Two new Romano-British ironworking sites in Northamptonshire - a new type of furnace? Britannia, 19, 275-98

Tylecote, R F and Owles, E (1960) A Second Century Iron Smelting Site at Ashwicken, Norfolk. Norfolk Archaeology, 32(3), 142-62

Appendix 1 Slag Listing by Context Number

CONTEXT	SMELT	HL	CIN	SSL	OTHER
17	2050			21	259
18	464				
19	260				
20	9				81
24	33				
28	11				
41	44				
52	645				
61	8				
62	278				
71	173			544	
92				107	
106	1861	1364			159
107	1068	276	17		106
128	290	25	3	13	12
137				1	
147				223	
163	187				
164	470				
184	20				
187			25		
249				80	
263			16		
299				38	
302	80				
303	107				
304	5				
337	203				
349	130				
357			3		
361					121
371					16
380	13				
385	304				
389	21				
416			3		
418	935	825			
437	441				
445	2332	176			99
461	60				
466	57				
486					33
493		1			
494	209				
512	677	380			
516	370				
521	343				
523	41				
528	28				
531	6				
544					35
556	455				
566	192				
577	21				
599	16				

CONTEXT	SMELT	HL	CIN	SSL	OTHER
622	82				
634	4665	487			
657	34				
665	8			25	
673	744				
678	46				
679	71				
680	196	165			
690	473				
2065	80				
2067	23				
2071	366				
2073	1657	20			
2075					69
2078	28				
2079	25				
2080	1753				
2083	651			148	
2088					30
2095	83				
9999	1700				
**********	**********	**********	**********	**********	**********
totals	27602	3719	67	2420	1020