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Evaluation of Archaeometallurgical
residues from the M7/M8 Contract 1:
Cuffsborough 4 (E2184)

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Abstract

The assemblage from this site comprises approximately 5.1kg of iron smelting slags, plus two concretions that have formed around corroding pieces of iron metal.

The majority of the residues derive from a pair of features corresponding to the basal pits of slagpit iron smelting furnaces. One of the furnaces has a calibrated ¹⁴C date within the 1st to 3rd centuries AD, which is not a period for which not many examples of smelting furnaces have been recorded. Descriptions of the furnaces suggest they had internal diameters of approximately 0.3m; this compares with the furnaces at Derrinsallagh 4, but is rather smaller than the probably slightly earlier paired furnaces at Clonrud 4 or Derrivorrigan 1.

The residue assemblages from the furnace pits are dominated by very fine grained material. The upper parts of the fills include some substantial pieces of vitrified wall from the area around the furnace blowhole, but there is a general lack of larger pieces of flow slag. This suggests that the furnaces were cleared after use and that most of the residues recovered are the fine material that accumulated within the deepest parts of the ash bed in the pit.

Other materials included two pieces of iron with adhering accretions (C2 and C114), a moderately large block of iron smelting slag (C168) and an indeterminate piece of hearth/furnace ceramic (C237).

Contents

Abstract	1
Methods	1
Results	1
Interpretation	2
Evaluation of potential.....	2
References	2
Catalogue	3

Methods

All investigated materials were examined visually, using a low-powered binocular microscope where necessary. All significant materials were summarily described and recorded to a database (Table 1). As an evaluation, the materials were not subjected to any high-magnification optical inspection, nor to any other form of instrumental analysis. The identifications of materials in this report are therefore necessarily limited and must be regarded as provisional.

Results

Iron smelting

The iron smelting residues include a wide variety of morphologies and types, ranging from a very large quantity of hearth bottom fines (small fragments of slag in the form of prills, blebs, "coffee bean" spheroids and the accumulation of other fines in a sinter-like material), through to larger pieces of flow slag (slag descending down into the slagpit through fuel from around the bloom), including some attached to the pit wall, through to well-vitrified pieces of furnace wall from the area around the blowhole.

The interpretation of the furnaces is somewhat uncertain based on the descriptions in the stratigraphic report. As with other examples of slagpit furnaces the scorching of the natural around the basal pit seems to obscure the true nature of the pit – and the size of the

cut needs to be treated with care. The thickness of the scorched material seems particularly thick with these examples. The size of the working pit appears to be around 0.3m in both cases, to judge by the quoted dimensions of the pit fills.

In furnace F151 there were three fills: a lower fill F156 in the base of the pit contained a typical pit base slag assemblage, dominated by fine grained materials, a middle fill F155 described as being 50% fired clay and containing a block of wall with attached slag (it is unclear whether this was in-situ) together with flow slags, and an upper fill F154 with a slag assemblage that was coated in ash, as well as further pieces of vitrified wall.

Furnace F152 there were also three fills: a lower fill F159, charcoal-rich and containing 1.8kg of fine-grained slag residues, a middle fill F161 with abundant fired clay and only a small amount of slag, and an upper fill F158 also containing much fired clay.

Outside the furnaces, smelting slags were limited to a single flow slag block from F168 (sample 286) and a dense worn fragment of slag from F2.

Other materials

A single small piece of slagged ceramic of indeterminate origin was recovered from F237.

Concretions, now exploding through expansion of the corroding iron contained within, were recovered from F2 and F114. In neither case was the nature of the iron obvious – and the iron may have been in the form of an artefact rather than as production waste.

F114 also contained a small piece of indeterminate pale grey weathered vesicular slag.

Interpretation

The presence of a pair of slagpit furnaces of Iron Age date is clear, even if the details of their morphologies are uncertain. The broad style of furnace has been described by Pleiner (2000) across a wide area of Iron Age Europe.

The recognition of slagpit furnaces is replacing an earlier interpretation of such remains as bowl furnaces (e.g. Scott 1990) and it is clear that some of furnaces of the Irish Iron Age were quite complex structures (e.g. Young 2008e).

Other sites on the M7M8 scheme have also produced evidence for apparent twinned furnaces. (e.g. Clonrud 4, Derrivorrigan 1; Young 2008 d, e), but current dating evidence would suggest that these are somewhat earlier than the Cuffsborough 4 examples. There is a tendency for the earlier furnaces to have rather larger diameters, and furnaces of about 0.30m diameter seem to be slightly later than the Clonrud and Derrivorrigan examples, perhaps being 1st century AD onwards. The rather more complex style of furnace at Derrinsallagh 4 (Young 2008e), which has a furnace arch and external working pit, has a pit of roughly the same size as the present examples, but is of uncertain age (dates from Derrinsallagh 4 as a whole seems to be 1st century BC – 1st century AD). The use of furnaces of about 0.30m diameter seems to have persisted for much of the first millennium AD (e.g. Young 2008a for a local early medieval example).

The dominance of very small slag particles in the slagpit furnaces is a feature noted at some other sites, but the controls on whether the dominant residues in the pit base are sintery fines or substantial flows is not well understood.

Evaluation of potential

The materials form an incomplete suite of iron smelting residues, but none-the-less are interesting for they were produced at a period with rather few known assemblages. They do have potential for shedding light on the mode of operation of slagpit furnaces of their period and also have potential for the further investigation of why some furnaces yield assemblages of fines whereas some apparently have substantial slag flows to the very base of the pit.

It is recommended that analysis be undertaken principally to characterise the fines assemblage. Retention of the materials is strongly recommended.

References

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<i>context</i>	<i>sample</i>	<i>sample weight</i>	<i>item weight</i>	<i>number</i>	<i>notes</i>
2	283		77	1	rounded lump, starting to explode - a concretion around a piece of iron
2	284		25	1	reddened smooth dark lump, dense, probably a worn derived slag
114	285		31	2	1 piece of exploded iron, 1 smaller piece of low density grey slag
154	278	1943	721	4	pieces of vitrified lining, mainly with a reduced reverse, but locally oxidised
			648	7	ashy slag, mainly charcoal-rich but some shows spaced flow lobes suggesting penetration between large fuel pieces
			rest	45	small slag pieces and matrix
155	279	769	297	1	large block of reduced vitrified wall with adhering poorly-developed flow slags
			19	2	small pieces of oxidised-fired vitrified clay
			389	39	small pieces of slag, mainly flow slag
156	280	1088	10	1	stone
			609	42	small flow slag pieces
			34	1	crust fragment - approximately 3-4mm thick, associated with overlying rough spiky layer to 15mm thick
			317	46	rough sintery slags - some very dense
			rest		finest and soil
159	292	1036		bulk	sample of tiny <10mm, pieces mainly brown sinter with some tiny flow slag pieces
159	291	101		bulk	coarser bulk residue, again mainly spiky sinter, but also some flow slags and few "coffee bean" spheroids
159	120	694		bulk	mainly spiky sintery material, good proportion of poor flow slag, a few pieces of reduced fired ceramic
161	122	45		bulk	slag debris - mainly porous material but a significant amount with flow lobes
168	286		114	1	flow slag lump
237	287		4	1	tiny scrap of oxidised fired ceramic with adhering purple slag

Table 1: Summary catalogue by context

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