The Petrology of the Loom weights from Flixborough, North Lincolnshire

Alan Vince

As part of a study of the mid Saxon settlement at Flixborough the author examined a representative selection with Dr P Rogers A series of questions was then raised about the manufacture and preparation of the loom weights, some of which could be answered by scientific analysis. Accordingly, a sample of six weights was selected by Dr Rogers in order to determine the source and nature of the raw materials used. The resulting data also provides a datum with which to compare contemporary pottery from the site.

Table 1 Identity of Samples

TS No	Context	SF No	P Rogers comments	Comments
AG137	535	580	Standard fabric-type	Fired/burnt in an oxidizing atmosphere after breakage?
AG138	3758	9355	Grey 'spalls'	Accidentally burnt in reducing atmosphere?
AG139	3758	1508	Standard fabric-type	Fired/burnt in an oxidizing atmosphere?
AG140	6136	6227	Fired at low temp	Fired/burnt in an oxidizing atmosphere?
AG141	5871	7624	Black 'spall'	Accidentally burnt in reducing atmosphere?
AG142	3758	5608	Fired at low temp	Too soft for thin-section

The samples were thin-sectioned and the thin-sections stained with a mixture of potassium ferrocyanide and Alizarin B (Dickson's method of staining). This helps distinguish calcite from dolomite, and iron-rich calcite from non-ferroan calcite. In the event, however, only one sample, AG138, contained any calcite.

Petrological Descriptions

AG137

The sample contained no inclusions larger than 0.1mm except for sparse voids which had once contained organic matter. The matrix was variegated contained abundant silt-sized quartz and muscovite, together with possible glauconite.

AG138

A similar fabric to that of AG137 with the addition of sparse specks of ferroan calcite.

AG139

The sample contained a sparse quartzose sand, consisting of rounded quartz and chert grains up to 0.4mm across and sparse subangular sandstone fragments containing quartz grains up to 0.2mm across. The clay matrix was variegated and contained sparse angular quartz and muscovite.

AG140

The sample contained abundant subangular and rounded quartz grains up to 0.4mm across in a matrix containing abundant angular quartz silt and moderate muscovite.

AG141

The sample contained sparse, subangular and rounded quartz up to 0.4mm across but was otherwise similar to sample AG137.

Discussion of Petrology

The basic clay used for most samples was variegated and contained a abundant quartz silt with lesser quantities of muscovite. It is possible that the calcareous variant, AG138, preserved these inclusions which had been leached from the remaining samples, or that the clay was a calcareous facies of an otherwise non-calcareous clay bed. In the absence of comparative data it is not possible to say for certain whether the clays could have been obtained from an exposure of Jurassic clay along the Lincoln Edge (which at Flixborough itself is wholly obscured by blown sand) or from a more recent clay from the Trent or Humber valleys. The grain size and quantity of inclusions suggests an estuarine rather than an alluvial origin for the clay, which would accord with the valley at Flixborough itself.

The quartoze sand found in AG140 and AG141 is similar to that found in the soil matrix which adhered to the fragments, which was typical of the blown sand in which the site was encased. Sands with identical petrological characteristics are found throughout the Trent valley and without detailed grainsize analysis there appears to be no difference between sands derived from wind action and those deposited by earlier courses of the Trent and Witham.

Chemical Analysis

The six samples were submitted for Inductively Coupled Plasma Spectroscopy (ICPS) analysis at Royal Holloway College, London under the supervision of Dr N Walsh. The results (see Appendix One) were studied using Principal Components Analysis (using the WinBASP package). When the analysis was run using all counted elements three main clusters were produced. These were based mainly on the frequency of iron (some of the other sherds from the site were imports made from clay with a low iron content). Also present in the cluster containing the loom weights were samples of Torksey ware (AG183-8), possible sherds of Lincoln-made sand-tempered wares (AG180-2), a sherd now interpreted as a Trent valley Romano-British greyware (AG183) and three imported grey burnished wares (AG192, AG195 and AG198). The two reduced samples, AG138 and AG141 produced very similar chemical analyses. In order to test that this clustering was not simply an artefact of sampling, caused solely by iron content, the analysis was run again omitting iron (Fig 1). The loom weight analyses this time were more widely spread, although the reduced samples still fell close together. AG139 and AG140, the two samples which contained quartzose sand, plotted some distance away from the remaining four samples. This is presumably the result either of elements being introduced with the sand or the sand acting as an inert filler, depressing the quantities of other elements. AG140 does indeed have the lowest values for most of the elements measured. AG139, on the other hand, is distinguished by high values of Al_2O_3 and Fe_2O_3. Surprisingly, however, Zr, which should be positively correlated with quartz sand, gave moderate values for both these samples. Thus chemically, the results obtained from all samples except for AG139 suggest a similar composition, varying mainly through dilution (hence the linear plot in Fig 1) whereas AG139 does have a different composition. The significance of this variation, which is not reflected in the ceramic petrology, cannot be established without further sampling.

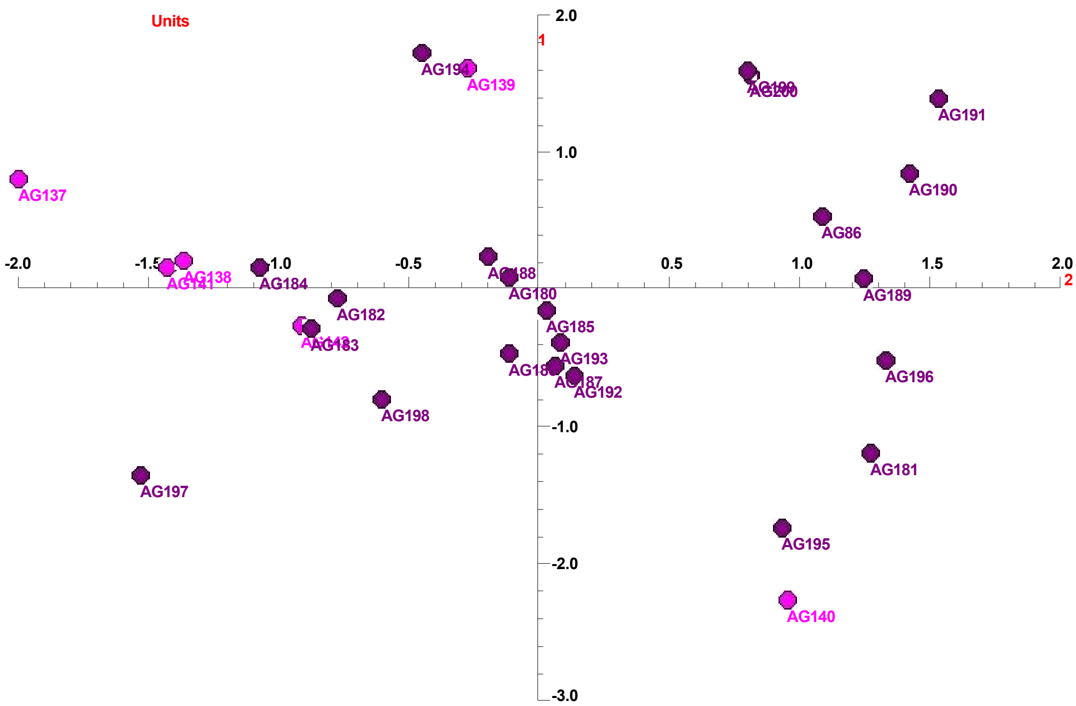

Figure -1 Principal Components Analysis plot for Flixborough loom weights compared with other sand-tempered wares from the site.

Appendix One.

Table 2 Major elements (%)

TSNO	Al2O3	Fe2O3	MgO	CaO	Na2O	K2O	TiO2	P2O5	MnO
AG137	17.62	7.67	1.84	1.75	0.74	2.51	0.52	1.89	0.16
AG138	15.97	7.04	1.82	2.55	0.93	2.51	0.84	0.74	0.13
AG139	20.52	10.94	1.27	0.75	0.48	2.63	0.89	0.29	0.03
AG140	10.78	4.99	1.22	3.65	0.43	1.83	0.47	0.42	0.08
AG141	16.16	7.05	1.93	4.29	0.59	2.41	0.76	1.02	0.11
AG142	14.77	7.13	1.95	1.88	0.69	2.22	0.67	0.31	0.18

Table 3 Minor elements (ppm)

TSNO	BA	CO	CR	CU	LI	NB	NI	SC	SR	V	Y	ZN	ZR*	LA	CE	ND	SM	EU	DY	YB
AG137	801	19	118	58	69	5	62	17	158	108	25	135	43	53	95	35	8	1	4	2
AG138	629	20	106	21	66	15	58	15	187	115	24	137	57	48	88	35	8	1	4	2
AG139	457	17	131	146	97	16	54	22	111	140	20	111	52	47	98	27	7	1	3	2
AG140	358	13	65	23	48	9	40	10	116	84	17	95	56	35	60	25	5	1	3	1
AG141	657	18	102	40	70	14	57	15	225	119	24	166	62	49	86	36	8	1	4	2
AG142	383	18	92	19	69	12	51	14	122	119	25	112	92	44	84	30	7	1	4	2