



## **Een verkeerde loop in't vuur<sup>1</sup>: an initial investigation into what Dutch archival sources can tell us about techniques and problems in the production of 17<sup>th</sup> and 18<sup>th</sup> century Dutch tin-glaze tiles**

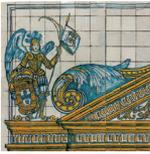
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*SUMMARY: Technical art-historical archival sources can be invaluable for our knowledge and understanding of the origin and preparation of materials as well as the production techniques used to make ceramic objects. The information provided can also aid our understanding of the factors that influence susceptibility for degradation as well as provide details which could aid provenance studies. The production of Dutch tin-glaze tiles is poorly understood within an historic context. Most early written technical sources on tin-glaze production are in the form of treatises written by educated observers rather than the potters themselves. Also, while being of significant comparative interest, such treatises are not directly related to either Dutch tin glaze or tile production. Luckily a number of 17<sup>th</sup> and 18<sup>th</sup> century primary written sources and archival records dating as far back as 1620 have survived in the Netherlands in the form of recipe books, kiln records and legal documents that contain information directly relating to tin-glaze tile production. These documents provide insight into the composition and preparation of the clay and tin glaze as well as the problems encountered with specific recipes and firing. In addition, pottery inventories provide information concerning the use and import as well as the cost of the raw materials. More than 150 recipes for clay mixtures, tin glaze, 'kwaart' (lead glaze or 'coperta') and glaze colours can be found in these early sources relating to factories in Delft, Harlingen, Makkum, Utrecht and Rotterdam between 1659 and 1862. The recipes not only show variations in the composition and ratios of the materials that make up a tin glaze, primarily 'masticot' (sand and 'soda') and 'tinas' (lead, tin), but also describe the variations in quality and provenance of raw materials for each recipe. Furthermore, information concerning clay mixtures is also documented as well as details regarding kiln structure and firing problems. This preliminary investigation into Dutch archival records is part of more extensive research project into changes in the production of 17<sup>th</sup> and 18<sup>th</sup> century Dutch tin-glaze tiles and its relation to tile deterioration and glaze stability.*

*KEY-WORDS: Tin glaze recipes; Dutch tiles; archival sources*



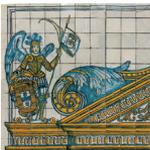
## INTRODUCTION

The issues discussed here are the result of on-going research into archival sources related to the production of early Dutch<sup>2</sup> tin-glaze tiles. The production of early Dutch tiles is poorly understood and one of the aims of this research is to relate the information found in contemporary archive sources with the results of analytical analysis of early tiles in order to gain greater understanding of changes in early Dutch tile production. It is believed that this information can help the conservator's understanding of deterioration processes observed in tiles and possibly place the susceptibility for deterioration within an historical context. Of particular interest is the documentation relating to glaze and clay composition and use, as well as the production problems encountered by early tin-glaze tile makers. Tin glaze was first used on tiles in the Northern Netherlands in the late 16<sup>th</sup> century by potters of Italian origin who had emigrated from Antwerp. During the following two centuries, the production of tin-glazed tiles grew into an important industry with significant production centres developing in cities and towns including Gouda, Haarlem, Delft, Utrecht, Rotterdam, Amsterdam, Harlingen, Bolsward en Makkum. During the 17<sup>th</sup> and 18<sup>th</sup> century millions of tiles were produced in the Northern Netherlands and an extensive export trade grew within Europe and beyond. The 17<sup>th</sup> century was a period of rapid economic and political change in the region and this was reflected in the production of Dutch tin-glaze tiles until the mid-18<sup>th</sup> century when production began to decline.

## ARCHIVAL SOURCES

Recent research has increased both the interest in, and the understanding of, early Dutch tin-glaze wares.<sup>3</sup> This follows earlier relevant research into Friesian tin glaze production.<sup>4 5</sup> The research into technical art-historical written sources discussed here focuses on Dutch tin-glaze tiles, in particular the source and preparation of materials and variations in the production process. Most early written technical sources are treatises written by educated observers rather than by the potters themselves. While being of important comparative interest, these treatises are either not directly related to Dutch tin-glaze production<sup>6 7</sup> or do not specifically discuss the production of tiles.<sup>8 9 10</sup> Pre-industrial potters and tile-makers rarely left written archives. Apart from the problem of literacy, there were the issues of professional secrecy, the regular occurrence of workshop fires, and the common problem of insolvency resulting in the sale or destruction of the contents of a pottery. Luckily a number of 17<sup>th</sup> and 18<sup>th</sup> century primary written sources and archival records directly relating to the production of tiles have survived in the Netherlands in the form of recipe books, kiln records and legal documents.

One of the most significant sources to have survived is a 160 page hand-written notebook written between 1712 and 1720 by the Harlingen 'Doctor of medicine and tile-maker' Petrus Sijbeda.<sup>11</sup> Petrus Sijbeda came from a family of Harlingen potters and the book includes a number of recipes used by his father Theunis Clasen. In this small book Sijbeda documented about 60 tin-glaze and 'kwaart' (coperta) recipes, giving the composition and ratio of materials as well as details on a number of cities in which the recipes were used as well as information on the quality of the glazes (Figure 1). The recipes dating from 1620 to 1720 and are attributed to factories in Harlingen, Makkum, Delft Rotterdam and Utrecht. Sijbeda also describes recipes for glaze colours and gives information on clay preparation as well as



kiln design. The last four pages of the book are written in a different handwriting which describe glaze recipes dating from 1754 to 1758. It is not known who is the author of this section. Another important source of information is a transcript of the 18<sup>th</sup>-19<sup>th</sup> century kiln book kept by another Harlingen tile maker, Sijbrand Feijtema.<sup>12</sup> Feijtema provides a number of glaze recipes as well as describing in detail problems with the firing process and the attempts to adapt the construction of the kiln. Focusing on legal documents, a former director of the Rotterdam Historical museum, Hoyneck van Papendrecht, undertook a detailed research of the Rotterdam archives at the beginning of the 20<sup>th</sup> century, gathering much material relating to Rotterdam tile factories as well as references on the import and cost of clays.<sup>13</sup>

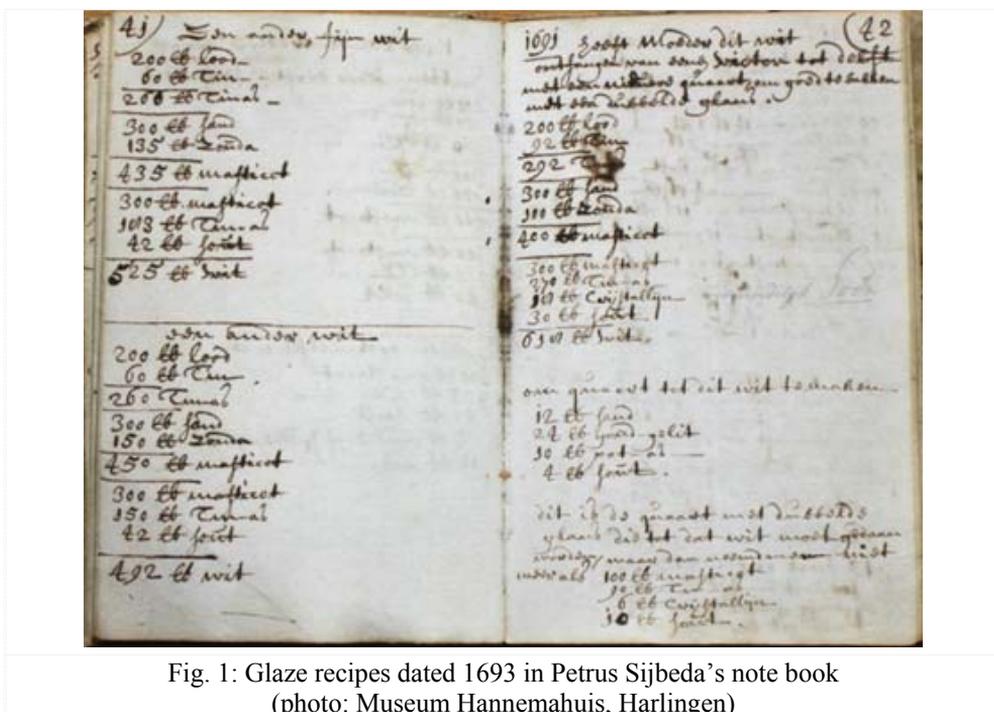


Fig. 1: Glaze recipes dated 1693 in Petrus Sijbeda's note book (photo: Museum Hannemahuis, Harlingen)

## TIN GLAZE

### 'Masticot' and 'Tinas'

Together Sijbeda and Feijtema provide a great deal of information relating to tin-glaze compositions in the 17<sup>th</sup> to 19<sup>th</sup> century which closely reflect the information in earlier sources including Kunckel and Piccolpasso. The recipes given describe tin glaze as being made up of two compounds, the first being *masticot*. Masticot was a mixture of sand and soda and/or potash (approximately 2:1 by weight) which was melted in the bottom of the main kiln before being broken up and ground into a powder. The second compound was *tinas*, composed of lead and tin (approximately 10:3 by weight) which was calcinated in a



separate ‘tinas’ kiln. The *masticot* and *tinas* were then combined (often with added salt and/or potash) in a ratio of approximately 10:6 by weight before again being melted in the kiln and milled to make a glaze. Both the ratios and source of the raw materials are seen to vary in the recipes described. Soda is documented as coming from England, Scotland, Alicante and Delft. Potash is described as *wied-as* (plant ash), or simply *pot-as*. Lead is written as *lood*, *theelood* (tea lead)<sup>14</sup> or *oude plat lood* (old lead sheet). In the pure lead-glaze *kwaart* recipes, *goudgelit* (litharge) was used, suggesting that a purer raw material was considered necessary. We also gain some insight into the source of the sand used in the 18<sup>th</sup> century to produce the *masticot*. Feijtema mentions that sea sand was used, commenting that Terschelling sand produced a poorer product than sand from The Hague. There was clearly an active trade network for raw materials. Feijtema discusses the advantages of using St. Ube’ salt (from Setubal near Lisbon) to make the *masticot*.

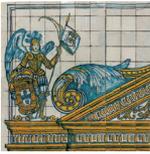
## Tin percentage and glaze quality

The proportion of tin in the *tinas* in most of the recipes ranges from 25 – 33% by weight. Sijbema describes variations in the quality of tin using the terms *fijne tin* (good quality) and *keur tin* (standard quality). English tin was of the highest quality, then tin from Holland and finally tin from Friesland. The quality of the different glazes is also recorded, ranging from *sleght* (poor) white to high quality *wit wit*. Both the quality and price of the products were closely related to the proportion of tin. Sijbema notes that the best tin glaze has such a high proportion of tin that it is too expensive to be practical<sup>15</sup>, although he later comments that it is worth using a good quality glaze as the wares can then be sold for a higher price.<sup>16</sup> Three recipes attributed to the Rotterdam factory owned by Adriaan de Meijer are of three different qualities.<sup>17</sup> One of the Rotterdam recipes is described as being ‘cheap and suitable for poor quality tiles and pots’.<sup>18</sup> When one looks at all the glaze recipes documented by Sijbema one sees a noticeable reduction in the percentage of tin used in the glaze recipes dated between 1670 and 1680, and a more general reduction from the mid-17<sup>th</sup> century to the mid 18<sup>th</sup> century. There are no evident differences in the recipes used at the different factories mentioned and it is clearly suggested that individual factories used different qualities of tin glaze. Work is now being undertaken to document the recipes to analyse relevant aspects of glaze composition such as the final proportion of flux and the presence of significant impurities that may have been present in the raw materials.

## THE CLAY

### Marl

The importance of using calcium-rich clays in the production of tin-glazed wares has been mentioned in all of the earliest sources. Calcium carbonate has a high coefficient of expansion, and, in the right proportion in a clay, it will ensure that the contraction of the ceramic on cooling will be close to that of the tin glaze, avoiding the creation of excessive tension between the ceramic body and glaze which can result in crazing of the glaze. Although calcium-rich clays do exist in the Netherlands, most 16<sup>th</sup> or 17<sup>th</sup> century potters would have not have been aware of their existence as these clays were difficult to extract. The first tiles produced in the Northern Netherlands were made using local clays that fired to a red colour and the tiles were often cracked or warped. Early tin-glaze tile makers soon found sources of calcium-rich clays or *marl* in England (Norfolk) and Flanders in the



Southern Netherlands (Doornik). Sijbema recommended mixing Friesian clay with Doornik clay in proportions of three to one and with English marl in proportions of four to one, suggesting that the calcium carbonate percentage of the English clay was higher than that from Doornik. He warns that the potter should not be economical with the Doornik clay otherwise it may result in problems with the glaze.<sup>19</sup> English archival evidence proves that that English marl was transported from Yarmouth to Rotterdam as early as 1595.<sup>20</sup> Hoynck van Papendrecht found a number of early 17<sup>th</sup> century archival references related to the import of English clay to Rotterdam. The earliest Dutch reference is from August 1629 when the Rotterdam trader Michiel Pieterszn Dullaert was recorded as selling imported English clay to four Rotterdam tile makers.<sup>21</sup>

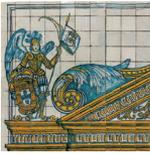
## Clay Mixtures

The imported marl was mixed with local clay. Both Sijbema and Hoynck van Papendrecht document recipes for clay mixtures used to produce tin-glaze tiles as well as other tin-glaze wares. The clay mixture recommended by Sijbema was a combination of marl and local clay, sometimes with the addition of *swarte aarde* or 'black clay'. Seventy years later Paape described the clay mixture used in Delft as being made up of 6 *wagons*<sup>22</sup> of Doorniks clay, 3 *wagons* of Rijnland or 'black clay' and 2 *wagons* of local Delft clay. The exact source and properties of the 'Rhineland' clay is not clear and is being investigated. This third clay would probably have been added to improve the strength of the ceramic and possibly also the colour. Hoynck van Papendrecht found archival references to the use of 'black clay' from the mid-18<sup>th</sup> century<sup>23</sup>. Sijbema couples 10 glaze recipes to different clay mixtures. He describes a Harlingen clay mixture dated 1670 that is suitable for tin-glaze tiles, consisting of equal proportions of Doorniks marl and Delft clay but omitting the black clay. For other tin-glaze wares he recommends that the 'black clay' be added. He comments that the black clay increases shrinkage, which may have been disadvantageous for tile making.

The growth of tile production in the Northern Netherlands took place during a time of war and economic competition and there were periods in the 17<sup>th</sup> and 18<sup>th</sup> century when the import of clay from Doornik, Germany and England was prohibited or even banned.<sup>24</sup> Sijbema mentions a problem with crazing ('cracking') of the glaze at a time when calcium-rich clay sources were restricted.<sup>25</sup> Feijtama writes that in 1796 they had serious problems with the glaze and discovered that employees of the factory had secretly reduced the percentage of Doorniks clay in the clay mix because the clay was difficult to obtain and they were worried they could lose their source of employment.<sup>26</sup> As a rule of thumb the clay mixtures described in the archival sources seem to fall within the calcium carbonate percentage suitable for tin glazes. At present research is being undertaken into the sources and composition of the imported clays, especially the marls, in order to gain greater insight into how the different clay pastes could have influenced the quality and stability of the final glazed product.

## DISCUSSION

This research is on going and although the interpretation of the material is (and will remain) a challenge, it is of great relevance to both art historians and conservators in their understanding of early Dutch tiles. It is hoped that more will be learnt through further research of the sources of raw materials, clay mixtures, glaze composition and firing practices. There are plans to reproduce some of the recipes of both the clay pastes and glazes



in order to gain insight into the influence of the variations described on glaze stability. The deterioration of historic tin-glaze ceramic tiles is generally a result of a combination of environmental factors and problems intrinsic to the tiles themselves. When considering conservation issues conservators tend to focus on the objects and the state in which they are found. Often scientific analysis of the material is carried out in an attempt to understand the physical nature of the objects and the characteristics that may have influenced their deterioration. The hope is that that information derived from archival sources will aid the interpretation of chemical and material analysis, possibly placing issues of susceptibility to deterioration within a clearer historical context. These archival documents not only provide insight into the technical history of Dutch tiles in the Netherlands, but also the many millions of Dutch tiles that were exported all over the world. Furthermore, many of the early tin-glaze potters in England, Spain and Portugal were immigrants from the Southern or Northern Netherlands who brought their recipes, techniques, and experience with them. The insights that can be derived from these Dutch archival sources could also be of relevance in the investigation of tin-glaze tiles in other European centres of production.

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## References

- <sup>1</sup> 'A wrong turn in the firing': FEIJTAMA, S. *Aenmerkingingen Rakende de Gleibakkerij*, [1725], Transcript, Museum Hannemahuis, p 3.
- <sup>2</sup> When discussing 'Dutch' tin-glaze tiles one has to be clear about the historical context. From the 16<sup>th</sup> to 18<sup>th</sup> century the political map of the region we now know of as The Netherlands, Belgium and Luxemburg was very unstable, influenced by religious persecution, war and economic change. From 1556 the region was under the control of the Spanish House of Habsburg and in 1568 the Northern region revolted against the Spanish house largely because of religious persecution resulting in the Eighty Years war. The *Northern Netherlands* only became the kingdom of the Netherlands in 1830 at which time the catholic *Southern Netherlands* became the Kingdom of Belgium. Therefore when referring to 'Dutch' tin-glaze in the 17<sup>th</sup> century one is referring to products from the *Northern Netherlands*.
- <sup>3</sup> VAN AKEN-FEHMERS, M. M., F. Burghout, N. Jaspers, S. M. R Lambooy, L. Megens, S. Ostkamp, G. Verhaar, *White Delft. Not Just Blue*, Ed. T.M. Eliëns. Den Haag: Wanders, 2013.
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- <sup>12</sup> FEIJTAMA, S. *Aenmerkingingen Rakende de Gleibakkerij*, [1725], Transcript, Museum Hannemahuis.
- <sup>13</sup> HOYNCK VAN PAPENDRECHT, A., *De Rotterdamsche plateel- en tegelbakkers en hun product, 1590-1851 : bijdrage tot de geschiedenis der oude Noord-Nederlandsche majolika*. Rotterdam: Waesberge, 1920.
- <sup>14</sup> The direct translation of *theelood* is 'tea lead' which refers to the thin lead sheets used for lining tea chests.
- <sup>15</sup> SIJBEDA, p 46.
- <sup>16</sup> *ibid*, p 7.
- <sup>17</sup> *ibid*, pp 22-21.
- <sup>18</sup> *ibid*, p 22.
- <sup>19</sup> *ibid* p 64.
- <sup>20</sup> BETTS, I. M., R.I. Weinstein, *Tin-Glazed Tiles from London*. London: Museum of London, 2010, p 17.
- <sup>21</sup> Hoynck van Papendrecht, p 29.
- <sup>22</sup> Clay was measured-out in *wagons*, the carts used for transporting clay.
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