

Introduction and Deployment of the Ceramic Industry in the Xiongnu Empire

Isao Usuki

Abstract: Xiongnu is the first nomadic empire in the eastern Steppe Zone. Unlike the nomads of the Mongolian plateau before them, they had innovative facilities such as earthen fortresses and kilns. The kilns emerged and were used not only to produce pottery, but also to produce the tiles and bricks that decorated the fortresses and their interior buildings. This essay introduces a few examples of the Xiongnu kilns so far known from the end of the Western Han or the beginning of the Eastern Han period, when kilns were introduced to the region. These kilns were presumed to have emerged under the influence of kilns from the northern rim of the Han Dynasty. Among them, kilns at the Khustyn Bulag site are of particular significance, as they are the first kilns whose detailed structure is known north of the Han Dynasty territory.

Keywords: Mongolia, Inner Mongolia, Altai Mountains, Xiongnu, nomadic empire

10.1. Introduction

The Xiongnu people established the first nomadic empire in the eastern steppes of Eurasia. According to *Shiji*, they appeared between the fourth and third centuries BC and often attacked states in China. At first the Xiongnu were harassed by the Yuezhi in the west and the Donghu in the east. After the rise of Modu Chanyu, however, they dominated the whole Mongolian plateau. Ultimately, they defeated the Han Dynasty, dethroned its emperor, Liu Bang, at the Battle of Baideng in 200 BC, and came to hold a hegemony in North and East Asia.

The initial Xiongnu period is not very evident in the archeological context. However, in the period from the first century BC to the first century AD, they built earthen fortresses and used roof tiles, unlike earlier nomadic people in this area. Although pottery production had been practiced before the emergence of the Xiongnu, the Xiongnu began to produce relatively uniform low-fired stoneware with kilns. Essentially, the ceramic industry did not fit the activities of a nomadic culture, because such kiln firing demands the consumption of large amounts of fuel and soil and thus requires being settled in the area of production. However, the Xiongnu pottery found from this era is regarded as evidence that various peoples in the steppe area belonged to the Xiongnu nomadic empire, because they were distributed not only in the territory of the original Xiongnu ethnic group (Mongolia, the northern China periphery and Zabaikalie) but also in Central Asia and South Siberia, which the Xiongnu Empire incorporated into its realm. In addition, it is believed that the system of Xiongnu ceramic industry was passed on to the steppe area by later peoples such as the Xianbei or the Kitai and others.

As mentioned above, despite the fact that scholars have recognized that the Xiongnu ceramic industry played an important role in the activities of the empire, scholarly research has not sufficiently clarified its production system and its technical characteristics. This paper aims to elucidate these more by examining the actual conditions of production sites.

10.2. Current issues in the ceramic industry of Xiongnu

The Xiongnu ceramic industry was surely recognized by researchers from the beginning of Xiongnu archeological study. As pottery found from Ivolga Fortress and burials in Transbaikalia region were classified by measurements and production method, their characteristics were revealed (Konovalov 1976; Khamzina 1982). The fact that Xiongnu pottery was fired by kiln is especially important, because it proves the existence of skilled, dedicated potters. Moreover, pottery and roof tiles found in Abakan Palace, located in southern Siberia, were presumed to have been made by Xiongnu; researchers started to take notice of the distribution range and production system of Xiongnu pottery (Kiselev 1951). In their studies of Xiongnu pottery, Konovalov (1976) and Davydova (1995) classified more details and revealed the compositions of the ware. Pan Ling (2007) advocated chronological division by burial goods, including Derestai- and Suji-type pots.

As stated above, although the study of pottery as commodities has developed, the study of Xiongnu kilns and production systems has not, due to production sites remaining undiscovered. Kiln-like remains were found in Ivolga Fortress but cannot be confirmed as such. Later, pottery kilns of the Xiongnu were found and investigated at the Ustyud site in the Altai region (Kubarev, Zhuraleva 1986).

Additionally, a kiln was found and excavated in the Khustyn Bulag site in north central Mongolia (The National Museum of Korea et al. 2001). As our research project team continues to excavate other points of the Khustyn Bulag site, we have been able to develop a study of the Xiongnu ceramic industry on the basis of concrete examples.

10.3. Kiln sites in the territory of the Xiongnu Empire

Although ceramic products such as pottery, bricks and roof tiles have been found in various places in North Asia, only a few examples of kiln ruins directly related to Xiongnu ceramic production have been discovered. They are discussed below (Fig. 10.1).

10.3.1. Yustyd site (Kubarev, Zhuraleva 1986; Fig. 10.2, 3)

This site is located in the Koshi-Agachi district of the Altai Republic, Russian Federation. As the Altai Mountain area was located outside the homeland of the Xiongnu group, it is believed that it was a territory of another nomadic people, such as the Ge kun or Hu jie. It appears that pottery production was introduced while the Xiongnu Empire was bringing the surrounding area under its control. However, the nomadic archeological culture that inherited the tradition of the Altai Mountain area continued there at that time, and the Xiongnu culture did not replace it. Similar phenomena are also found in neighboring southern Siberia, in places such as Khakassia and Tuba. This would indicate the political influence of the Xiongnu Empire on the surrounding area.

The Yustyd kiln site is located on a slope descending from the east to the west on a terrace of the right bank of the Yustyd River. Two survey sectors were excavated there in 1978. In the first survey sector, the pit of the kiln remains was discovered. It is in the shape of an irregular circle with a diameter of about 3 m and a depth of about 90 cm in the center. Flat stones are placed along its wall, and a clay layer is stuck onto its inner wall. The bottom is slightly rounded. On the west side, there is a dugout passage. This is assumed to be the remains of a stoke hole. A large number of earthenware and charcoal fragments and a clay wall with handprints were excavated from the filling soil of the pit. Thus, it is estimated that products were discarded due to a failure of firing after the final firing of the kiln. In addition, another hole, which was thought to be part of the remains of another, earlier kiln, was found where the thick coal layer was deposited at the eastern end of the survey area, but no detailed excavation was made of it.

In the second survey sector, the remains of four kilns lined up along the east and west sides of the slope were found. All were supposed to be elliptical. The first kiln, located at the east end, is an elliptical pit with a major axis of about 3 m, with flat stones placed around it. Clay is stuck onto the bottom and the wall. Its depth is about 1 m. The second kiln was confirmed in the layer below the first kiln, and it is believed that the upper part of it was broken by the first kiln. Based on the deposition condition of the soil layers, its use period is believed to have been short. The third kiln was located to the west of the second kiln, and is estimated to be an elliptical pit of about 3.5 by 2 m. Flat stones were installed along the edge of the kiln, inside

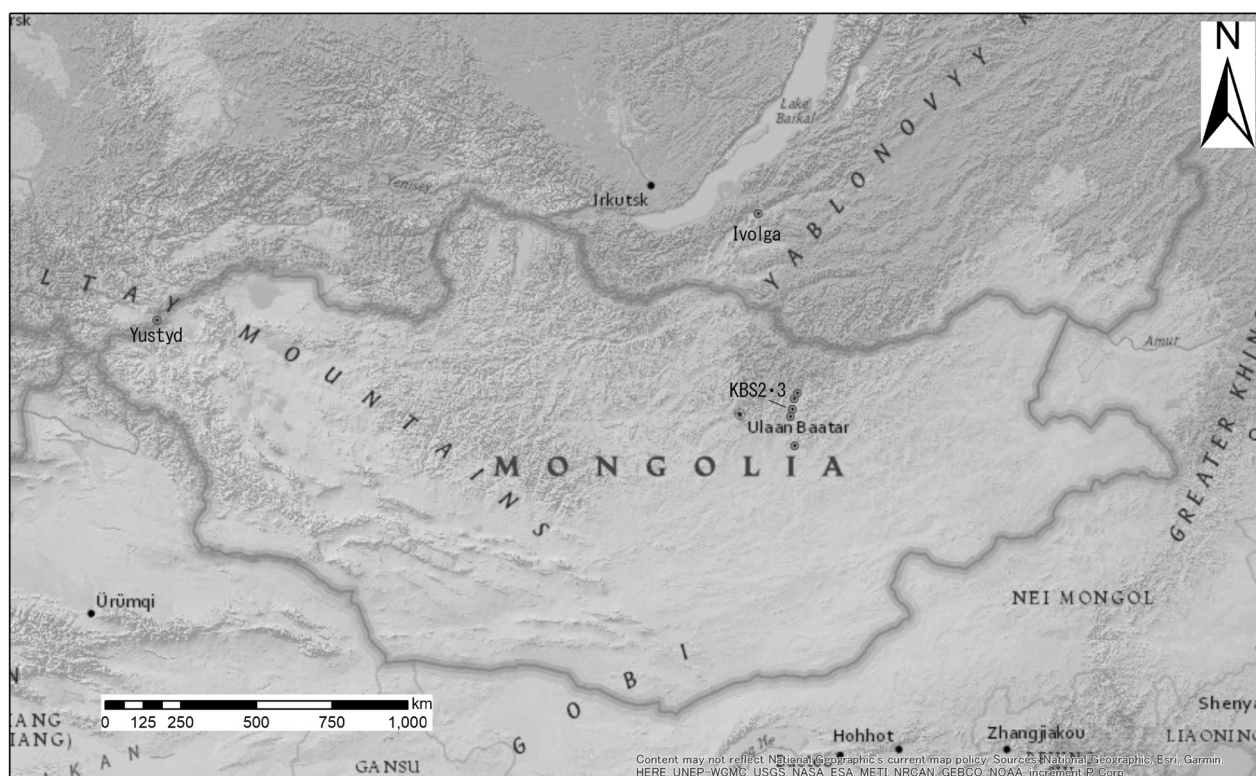


Figure 10.1. Location map of Xiongnu kilns and castle sites in the Kherlen River basin.

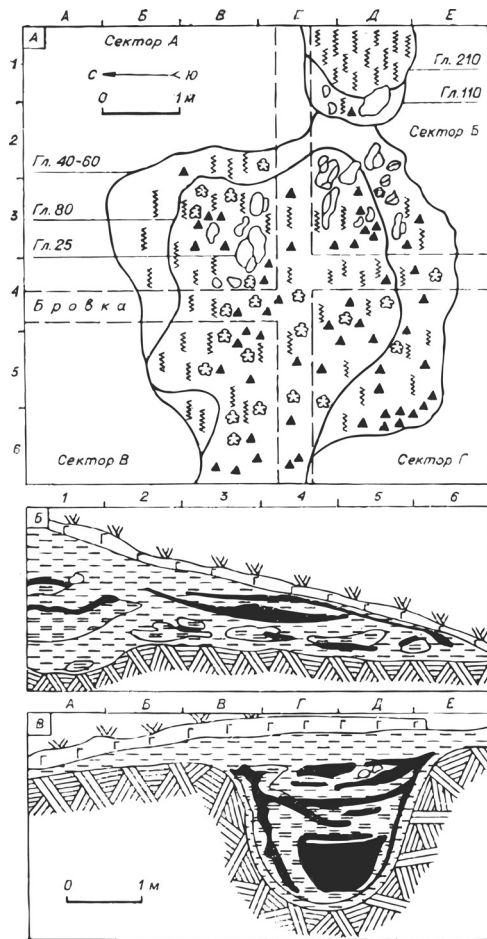


Figure 10.2. The kiln at the first survey sector of Yustyd site (Kubarev and Zhraleva 1986).

of which researchers discovered carbonized timbers and stuck clay. Because the third kiln destroyed the filling soil of the first kiln site, it is thought that this kiln was built later than the first kiln. The fourth kiln is located on the west side of the third kiln and has an oval shape of about 3 by 2 m in diameter. The same methods and materials were used to construct it as in the other kilns, such as the flat stone pavement and the stuck clay.

However, it is difficult to identify each of the above four kilns in the ground plan and stratum cross section. The basis for supporting the opinion of the excavator is not clear; therefore, the shapes of these remains are unclear. It can be judged that adjacent to the first kiln and the second kiln, between which there is a difference in height, are the firing chamber and the firebox of one kiln. The third kiln is also considered to have a two-chamber structure.

10.3.2. Ivolga castle site (Davydova 1995; Fig. 10.4)

The Ivolga castle site, which is a rectangular castle ruin that extends 348 m east and west, and 216 m north and south, was constructed on a river terrace located 16 km southwest of Ulan-Ude City, Buryat Republic, Russian Federation. On the edge of the river terrace, a rectangular earthen

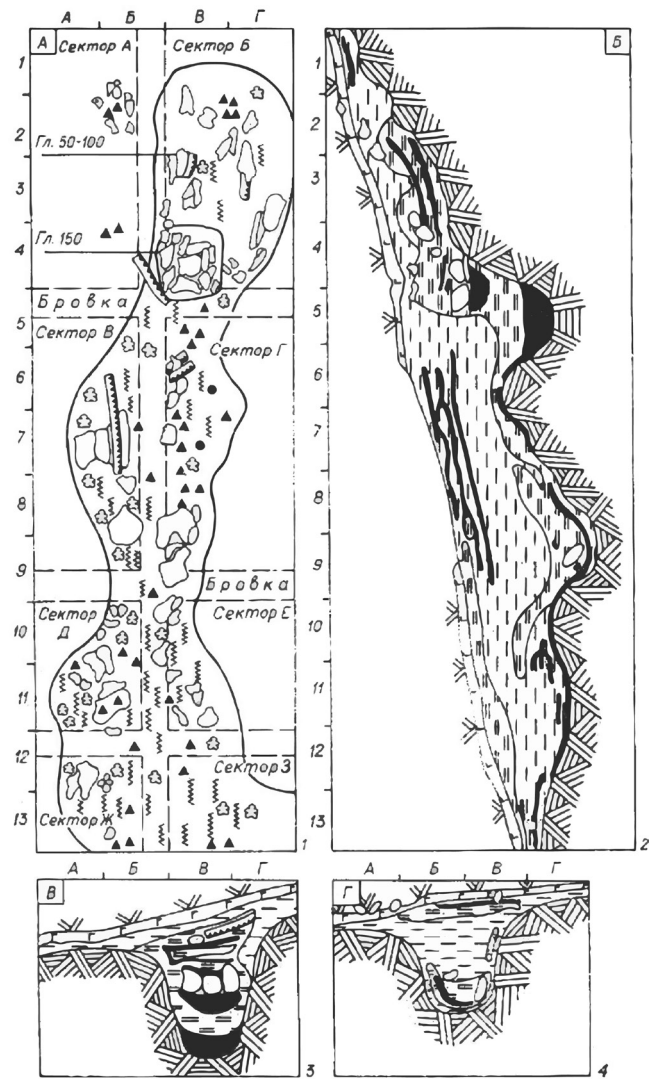


Figure 10.3. Kilns at the second survey sector of Yustyd site (Kubarev and Zhraleva 1986).

fort was built with ditches and walls, inside which many structures such as pit dwellings were built. Excavation in the southern part of the castle led to discovering many remains, such as a ground building, pit dwellings, a well and pits. Based on the excavated goods, it is presumed that the date of these remains is from the second century BC to the first century AD.

The excavator, Davydova (1995), pointed out that among these remains, pit No. 217 might have been a pottery kiln. This pit was dug near dwelling No. 49 and destroyed its entrance. Hence, the date of pit No. 217 is later than dwelling No. 49. It has an oval plan of 2.33 by 2.05 m and a depth of 1.15 m. The surface of its wall is pasted with clay lumps that were burned at a high temperature. Many fragments of burned timbers, charcoals and pottery were excavated from this site. Additionally, the skull of a woman buried in the wall was also found. The neighboring pit is separated by a thin wall extending from it, and it may have been fired from there. However, Dr. Davydova has not concluded that these remains were a kiln.

10.3.3. Khustyn Bulag 3 (KBS 3; Fig. 10.5)

The Khustyn Bulag site group is located in the upper basin of the Kherlen River in Tuv Aimag in Mongolia. It

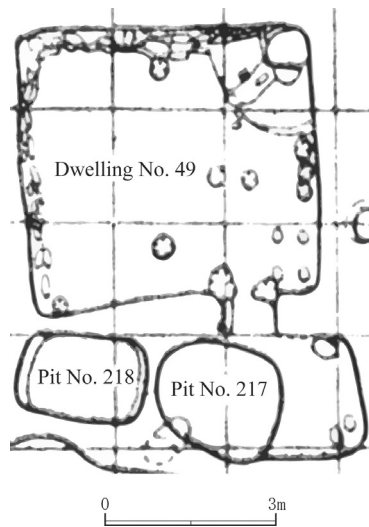


Figure 10.4. The kiln in Ivolga castle site, Pit No. 217 (Davydova 1995).

is located on a wide flat terrace on the northeastern shore of the Zuun Baidlag River, a tributary of the Kherlen River, and consists of many sites from the Paleolithic Age to the nineteenth century. In the Xiongnu era, large-scale iron-making and ceramics workshops operated in this area. The steel workshops are distributed over a range of about 1 km east–west at the western end of the terrace. Their operations continued from the third century BC to the first century AD. The ceramic workshops, in which roof tiles, bricks and pottery were produced, are located in the southeastern part of the terrace. There, kiln remains are distributed along the terrace cliff in the range about 1 km wide. We found the ceramics workshops at two locations (KBS 2 and KBS 3). ¹⁴C dating confirmed that they operated from the first century BC to the first century AD.

At KBS 3, mainly roof tiles and bricks were excavated. Here an elliptical pit (about 6.7 m north–south and 6 m east–west), which is regarded as kiln remains, was found. Its excavation revealed that the lower portion of the pit has a pentagon-like plan as a whole. Its northwest part is a rectangular platform. The southeastern part is a triangular space, and an elongated small pit is located at

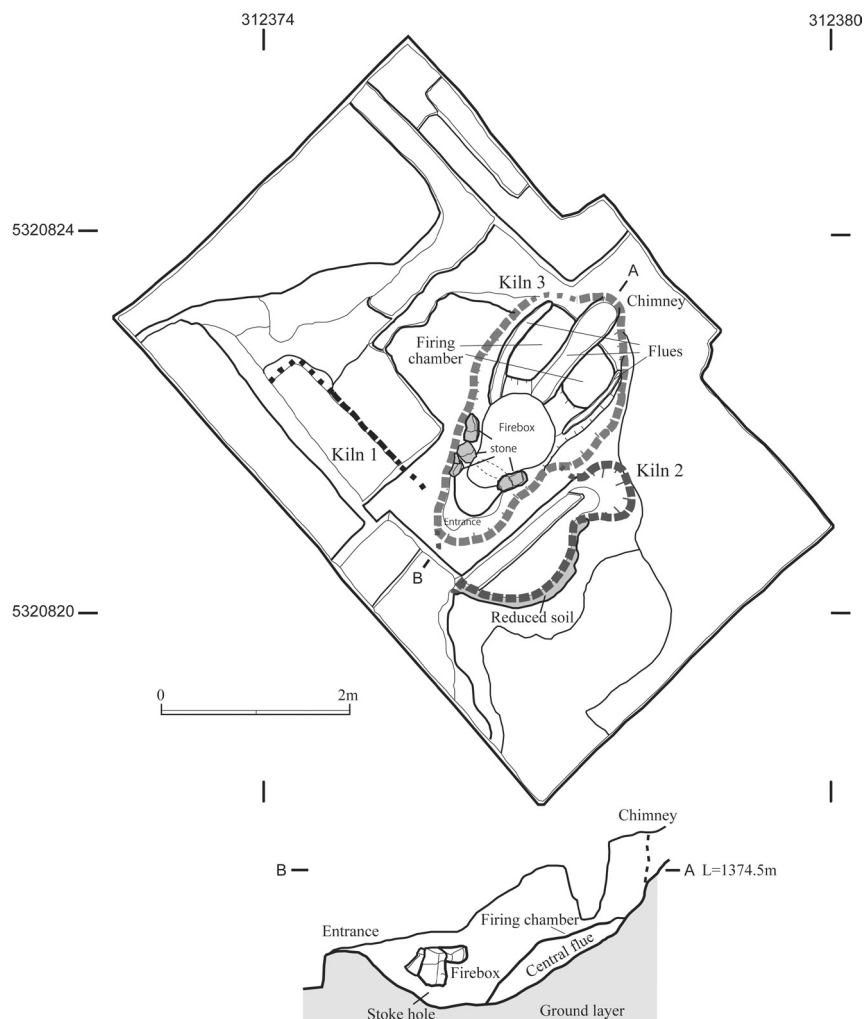


Figure 10.5. Estimated restoration of the kiln in KBS 3.

its tip. It is believed that these were the stoke hole, the firebox and the firing chamber of the kiln. On the north side of the pit, a vertical shaft and a horizontal shaft extending from the bottom of the vertical shaft to the elliptical pit were found. Those walls were burned hard. These are believed to constitute the chimney of the kiln. Another chimney was also detected in the east. Although there is uncertainty due to later destruction, another chimney would likely have been constructed in the west. An observation of the layer section of the firebox and the firing chamber revealed that the upper part of the kiln expanded into an elliptical shape after accumulations in the kiln built up after it was used several times. A large number of tiles, bricks, walls and carbide fragments had accumulated in the filling soil of the kiln. It is thought that these were intentionally left behind when the kiln was abandoned.

Based on the above, it is thought that this elliptical pit was originally a kiln that had a two-chamber structure and multiple chimneys, but that later it was reconstructed into an elliptical pit and unnecessary items and garbage were discarded there.

10.3.4. Mon-Sol project sector of KBS (National Museum of Korea et al. 2001; Fig. 10.6a)

A joint expedition led by the Institute of Archaeology, the Mongolian Academy of Sciences and the National Museum of Korea discovered kiln remains at the ridge of Khustyn Bulag, to the east of the KBS 3 site, and partly excavated it in 1999. In this excavation, the stoke hole and the work space of the kiln were discovered. The remains of masonry were found at the stoke hole. This is believed to have been the closure equipment of the kiln. Although the whole kiln has not been excavated, it appears to be a two-room-structure kiln like KBS 3.

10.4. Some characteristics of Xiongnu kilns

All of the above examples are semi-underground pit kilns. With the exception of the kiln of the Ivolga castle site, of which the details are unknown, it is thought that after the pits were dug, their walls and ceilings were constructed on the ground. Because the excavated fragments of pottery and wall pieces were fired with a reducing flame,

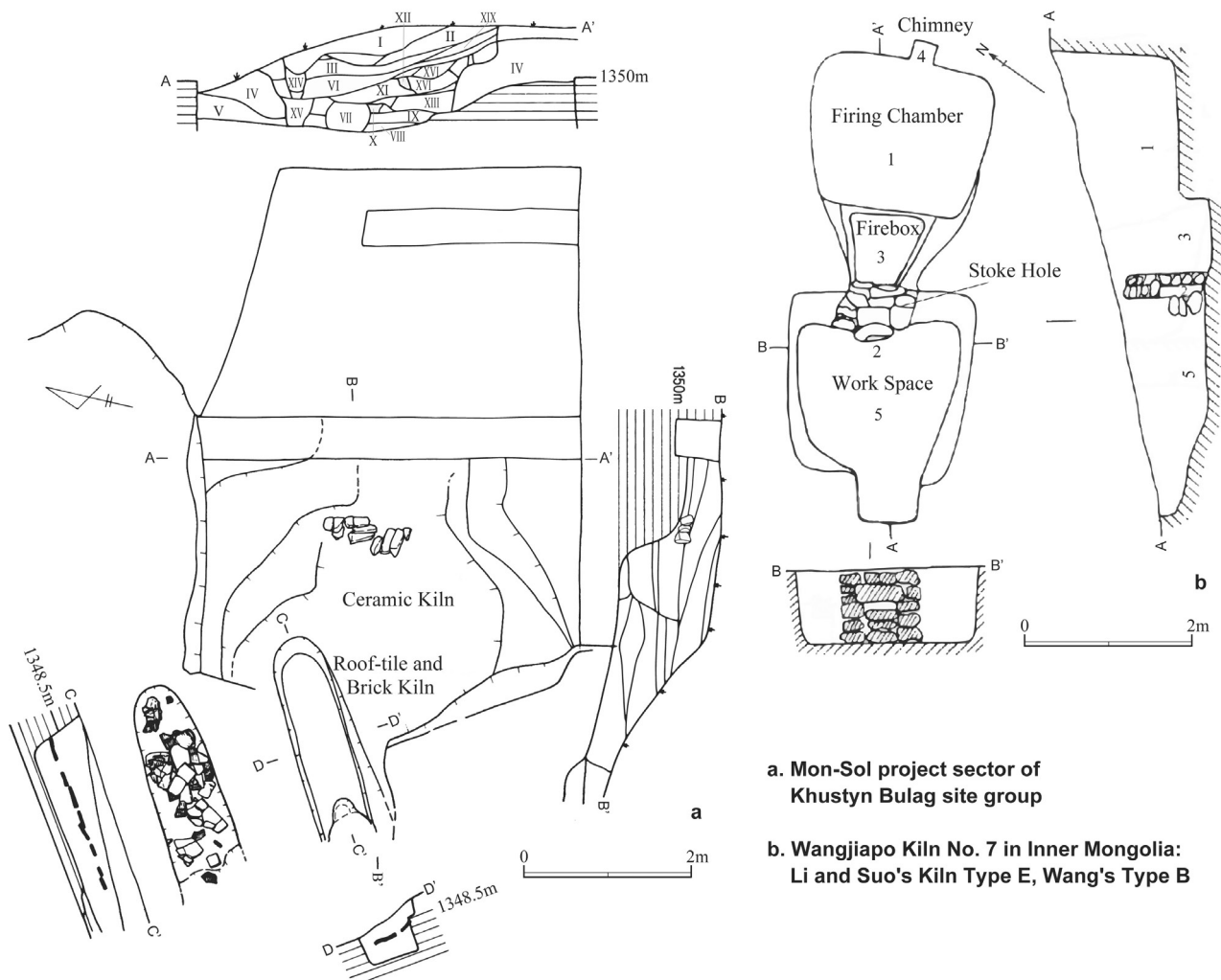


Figure 10.6. Kilns in Mongolia and Inner Mongolia (NMK et al. 2001, Wang 2011).

it can be assumed that the kiln was used in a sealed state. Furthermore, as mentioned above, some of the kiln remains of the second survey sector of the Yustyd site, as well as the kiln of KBS 3, are considered to be those of a two-chamber-type kiln.

In addition, the kiln of the second survey sector of the Yustyd site and KBS 3 have similarities, such as their location on the river terrace slope and walls constructed by pasting clay lumps, and they were intensely destroyed after firing. Based on the above points, it seems that they shared a common construction method and structure. However, as the kiln of KBS 3 has three chimneys, it seems that more advanced technology was introduced for it than for the kilns in the second survey sector of the Yustyd site.

In contrast, the kiln of the first survey sector of the Yustyd site is considered a whole kiln with a one-chamber structure. The inside of it was obviously burned. Furthermore, as it has points in common with the kiln of the second survey sector, such as flat stones at the wall side and clay lumps that show fingerprints, it is thought that it was a kiln. By the same token, the rectangular pit at the Ivolga castle site may be a similar kiln.

From the above findings, it is clear that there are two types of kilns in the Xiongnu ceramic industry. In the first type, firing is performed in one chamber. The second type consists of two rooms, a firing chamber and a firebox chamber, which are separated by a step. In the former, it is presumed that smoke was emitted from the ceiling, not the chimney. Also, the type 2 kiln has some variations in the number of chimneys or the shape of the firing chamber.

10.5. Chinese kilns from the Warring States period to the Han period

In the Mongolian steppes, pottery and roof tiles burned by a reduction fire were not made before the Xiongnu period, and such ceramic production obviously started under the influence of other areas. Moreover, the similarity in roof tiles and pottery between Han and Xiongnu shows the impact that the Chinese ceramic industry exerted. Indeed, the pottery and roof-tile-making technology, the paddling technique and the use of the potter's wheel began under Chinese influence. It is also necessary to consider the form of the Xiongnu kiln in comparison with the examples in China.

Regarding the construction of the ceramic kiln in the Han dynasty, Li Yufang pointed out that in the initial stage of the Former Han period, almost all kilns had an oval firing chamber, a single chimney and flue ditches along the wall, and that after the middle stage of the Former Han period, a rectangular firing chamber became common and a wall for separating flues or dividing flues appeared, and kilns with multiple chimneys increased (Li 1994).

Wang Chun Bin classified 69 kilns from the Warring States period to the Han dynasty into the following five types

based on the planar shape of the firing chamber: A (gourd), B (circle), C (oval), D (horseshoe), E (square), F (triangle) (Wang 2011). The type A kiln had a two-story structure, in which the ceiling of a firebox became the floor of a firing chamber. In the others, the firing chamber and the firebox were separated by a step. Almost all examples of type B had no chimney. Types C, D and E had single or multiple chimneys. As there is only one example of type F, it is a unique type. It is distinctive that the floor of its firing chamber surface was inclined. The date of each type is as follows:

Type A: Warring States period

Types B and C: Middle Warring States period–Early Han period

Type D: Late Warring States period

Type E: Final Qin period–Han period

Type F: Qin period

Type D is considered a transitional form of types C and E because the side wall of its firing chamber is curved. Therefore, the above dating is generally reasonable.

Li Wanqi and Suo Xiufen examined the kilns of the Qin and Han periods in the middle south region of Inner Mongolia, and explained their characteristics (Li and Suo 2015). They were divided into two types, A and B. In type A, firing was performed inside the single pit, and smoke was emitted from the ceiling. In type B, the firing chamber and the firebox were separated by a step, and chimneys are often installed. Type B approximately corresponds to Wang's types C, D and E. Li and Suo pointed out that, regarding chimneys, after the middle stage of the Former Han period, installations of multiple chimneys increased, and in particular the installation of three chimneys emerged after the late stage of the Former Han period.

10.6. Introducing the processes of ceramic-making technology into Xiongnu society

A comparison of the examples in China with Xiongnu kilns suggests that the features at the Yustyd first survey sector and the Ivolga castle site are the type A kilns defined by Li and Suo.

Other Xiongnu features are considered representative of the type B kilns by Li and Suo. Kilns at the Yustyd second survey sector are regarded as Wang's type B, because each firing chamber has an elliptical shape and no chimney. The kiln in KBS 3 is close to Wang's type E, because its firing chamber is nearly rectangular, and the overall shape is close to a pentagon (see Fig. 10.6b). Also, because the kiln of KBS 3 is thought to have had three chimneys attached, its characteristics place it after the middle Former Han period. Although the whole shape of the kiln at the Mon-Sol project is unknown, it may have features similar to those of KBS 3.

Xiongnu kilns have many characteristics in common with Chinese kilns from the latter half of the Warring States

period to the Former Han period. Generally, Chinese kilns are a little older than the estimated age of Xiongnu kilns.

It is certain that Xiongnu ceramic technology was influenced by China. But the date of kilns is estimated to be from the first century BC (middle Former Han period) to the first century AD (early Latter Han period), so clearly somewhat older ceramic technology than the contemporary Chinese technology was used except for KBS 3.

In addition, the masonry in front of the stoke hole of the kiln in the Mon-Sol project site is similar to examples of kilns of the Han dynasty in the Inner Mongolia area (see Fig. 10.6b), and it is thought that ceramic technology was introduced from the peripheral area of northern China. However, technology with China was introduced almost simultaneously for the kiln of KBS 3, and it seems that more advanced technology was introduced than in other areas of the Xiongnu Empire because it was constructed in the special area where castles were concentrated. It is also important to note that not only the form and the pattern but also techniques, such as the potter's wheel, paddling and polishing, were introduced from the Han.

Pan Ling (Pan 2011) pointed out that the shape and ornament pattern of Xiongnu pottery was closely related to the northern peripheral area of China, such as Inner Mongolia and Shanxi. In addition, Sagawa observed that the form of the kiln and the roof-tile ornaments are strongly related to those of Inner Mongolia (Sagawa 2018; Sagawa & Usuki 2020).

It is thought that the Xiongnu ceramic industry was initiated with the introduction of engineers and technology from the Han district, and that before long the manufacturing of roof tiles and bricks had already started. New pottery forms such as the pot, bowl and steamer were introduced. Because these are found at many Xiongnu sites, it can be inferred that they spread rapidly after the start of their manufacture. It is also important that large vessels for storing things emerged. These are not daily items in conventional steppe life; therefore, it can be concluded that they were not produced merely for daily necessity. Rather, it is thought that the Xiongnu Empire intentionally introduced ceramic products related to new institutions and lifestyles, and that their production and use subsequently spread within the Xiongnu territory.

The existence of roof tiles and bricks indicates that the Han architectural style was introduced. Tiles are used for large buildings inside the castle as functional and decorative elements. These structures are considered to have been political and ceremonial places, such as aristocratic residences or government offices. New forms of pottery show the influence of China in daily life. In particular, the emergence of large earthenware vessels suggests that food storage had expanded within Xiongnu society. These items imply changes in the political regime and food management of the Xiongnu Empire. Changes in politics and economy produced new demands, and the

ceramic industry was supposed to satisfy them and to strengthen the empire system. However, because people and technologies were introduced directly from adjacent boundary areas without interaction between states, it is generally thought that the most advanced technology in the central area at that time was not introduced into the Xiongnu Empire.

10.7. Conclusion

The introduction of pottery production by reduced firing in a kiln is believed to have started in the Xiongnu Empire in the third century BC. After that, many castles, Han-style architecture and large tombs were built in the empire around the first century AD. The production of tiles and bricks also began around this time. Products of the ceramic industry, such as pottery and roof tiles, were widespread in territories of the Xiongnu Empire, such as South Siberia. The existence of pottery production in the Altai region indicates that these products were locally produced in each area, and that the ceramic industry spread all over the steppe area. Kiln-fired pottery in the steppe area from after the Xiongnu era has some features in common with Xiongnu pottery in terms of technique and ornamentation; therefore, it is obvious that the Xiongnu tradition exerted a strong influence on the ceramic industry in the steppe area. In the future, it will also be necessary to clarify the transition process of the ceramic industry in the steppe area and the actual influence of the Xiongnu tradition in that area.

Acknowledgements

I am grateful to the Institute of Archaeology, Mongolian Academy of Sciences, for collaboration on the excavation in Khustyn Bulag site. I also would like to thank Amartuvshin Chunag, Eregzen Gelegdorj, Ishtseren Lochin, Sagawa Masatoshi, Shoji Tetsuo, Senda Yoshihiro, Yanagimoto Teruo for the support of my research (without honorifics titles).

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Ceramics-Firing Kilns of the Southern Russian Far East: Technological and Temporal Dynamics

Irina Zhushchikhovskaya

Abstract: The temporal dynamics of ancient kiln-type ceramics firing structures in the southern Russian Far East bordering China and the Korea peninsula are introduced. The development of ceramics-firing kilns was an important component of technological and cultural history in the region. The oldest evidence of simple kiln-like devices discovered are from the Paleometal period, dating to between 1000 BC and 1000 AD. An example of a vertical updraft firing kiln dates to the Pre-State period around 500 AD, and elaborated kilns have been discovered at sites from the Bohai State period (698–926) and the Jin Empire period (1115–1234). Bohai kilns are of a tunnel-like sloped type, and Jurchen kilns are of a one-chambered “*mantou*” type. The quality of ceramic products indicates that technical capabilities varied, and the examination of specimens fired in certain kilns with scanning electron microscopy and other methods are discussed.

Keywords: Kiln remains, updraft kiln, cross-draft kiln, temperature and atmosphere regimes, pottery, roof tiles, SEM, archeometric analysis

11.1. Introduction

This chapter introduces the development of kiln firing technology in the pottery-making of prehistoric and ancient populations of the southern Russian Far East. The research area is the Primor’e Region, lying to the south of the Lower Amur River and bordering northeast China to the west and the Korean peninsula to the south (Fig. 11.1). According to archeological data the earliest evidence of ceramics-making technology in this territory are dated to around 10,000–7000 BC, which is close to the time of the appearance of pottery in northern China, 10,000–7000 BC, and the southern part of Korean peninsula, ca. 8000 BC (Cho & Ko 2009; Jordan & Zvelebil 2009; Zhushchikhovskaya 2009). During the Neolithic, around 6000–1200 BC, ceramic wares became common, judging by the numerous pottery assemblages coming from archeological sites excavated at various localities in the Primor’e Region. The technology of pottery production at that time was relatively simple and undeveloped. In particular, there is no evidence of pottery firing in kiln-like devices. According to the results of archeological ceramics examination and experimental studies, bonfire (open firing) technology with average firing temperatures of 600–50°C seems to have been practiced widely during the Neolithic (Zhushchikhovskaya 2005: 76–77).

Obvious progressive changes in the physical properties and functional qualities of ceramics took place during the Paleometal period, corresponding primarily to the first millennium BC. These changes concern technological skills as well as morphological and decorative standards.

Among the most important changes were increased firing temperatures as a result of improved thermal processing techniques and technologies. The earliest archeological evidence of kiln-like structures in the southern Russian Far East is given in the fragmented remains of sites belonging to the Paleometal period. The remains of more complex, developed and better-preserved ceramics-firing kiln constructions were excavated at sites of the Pre-State period, fourth to seventh centuries AD, and especially at the sites belonging to the Ancient States period, eighth to thirteenth centuries AD. The research area at that time was initially part of the Bohai Kingdom, 698–926, and later part of Jurchen states – the Jin Empire and Dong Xia states – dating generally to 1115–1233 (Zhushchikhovskaya & Nikitin 2014, 2017).

For the Russian Far East as a whole, the Primor’e Region is the only one where the temporal sequence of excavated remains of early firing structures is known. These archeological relics give us important information about the temporal and cultural dynamics of the kiln firing technology applied to ceramics production in prehistoric and historic times. Various kinds of archeological evidence concerning kiln firing technology can be distinguished. The main evidence is, obviously, the excavated remains of firing devices, which are quite important for judgments about the type of kiln construction and its technical capabilities. The fired ceramics discovered inside the excavated structure or in close proximity are of great value for detecting a kiln’s working conditions such as temperature and atmospheric regimes, and the estimation of the quality of the finished product. The bulk of ceramic artifacts discovered at