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Zīzyāʾ Pottery Factory, al-Jīzā, Jordan: Continuity and Change

Abstract

This study examines interconnected elements within a modern industrialized ceramic manufacturing context: artisans, technology, scale of production, and spatial organization. Modern quantitative data and six years of on-site observations contribute ideas to interpret partial archaeological evidence from ancient pottery workshops. Influences are identified that promoted continuity of the Zīzyāʾ system and forces of recent changes.

Introduction

The Zīzyāʾ Pottery Factory is managed by the Salem family who emigrated from Hebron to Jordan several generations earlier. They reestablished their factory on land rented from the Khadeer family, members of the local Askoor Bedouin tribe, who were given vast lands in this area by King Abdullah I. At Zīzyāʾ, the same family continues to supervise manufacture and marketing of water jars. The clay body is formulated with salt temper to produce vessels with white surfaces in the modern Hebron tradition (ʿAmr 1992: 222).

For nearly four decades, scholars and students were welcome visitors to Zīzyāʾ Pottery Factory. Ceramic specialists, H.J. Franken (1986), G. London and M. Sinclair (1991), and M.L. Sidoroff (2015) recorded spatial and technological continuity at an industrial ceramic workshop. H.J. Franken (1986) documented the early factory layout and technological sequences similar to later reports, but he believed "traditional pot making was finished in Jordan and belonged in the past (1986: 146)."

London and Sinclair (1991: 421–5) examined manufacturing issues within the context of a survey of potters in Jordan for information useful to archaeologists. At the time of their visit, Zīzyāʾ was still a small scale industry with continuity in a salt infused clay body, manufacturing a variety

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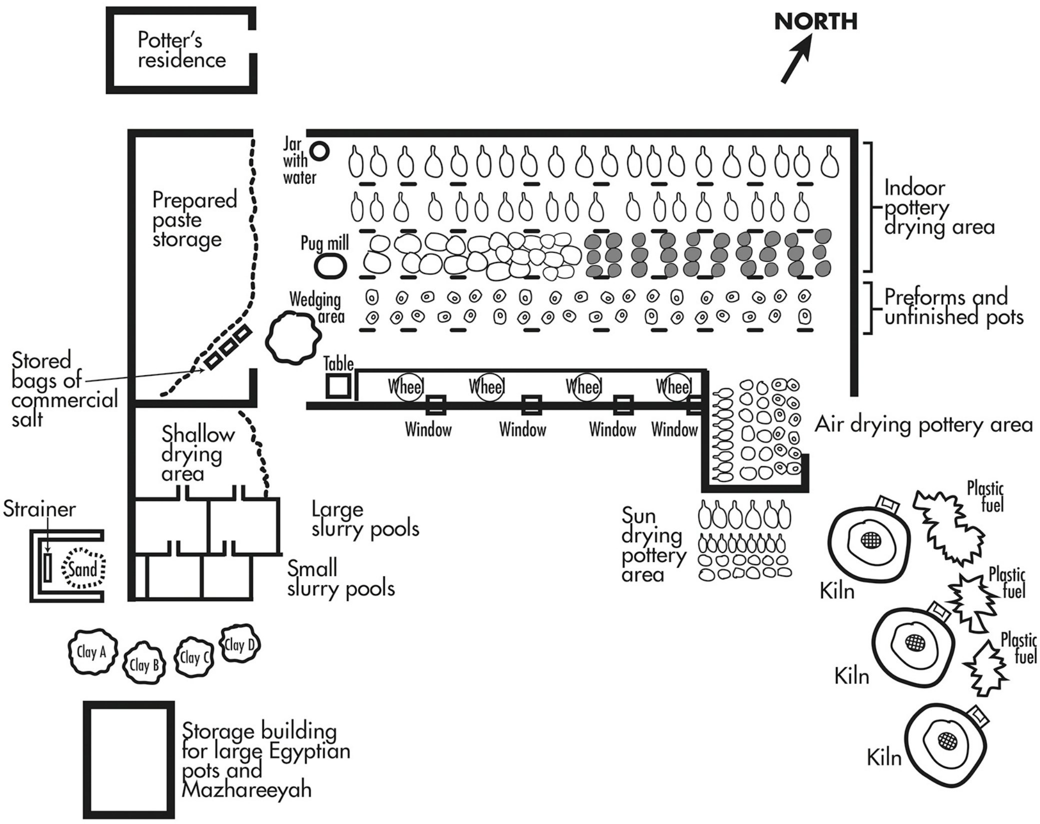

1. Layout of Zīzyā' factory grounds (Sidoroff 2015: fig. 1).

of vessel types on the potters' wheel, and firing in an updraft kiln.

Thirty years later, the next scholar to visit Zīzyā' had the opportunity to observe a factory transformed into a highly intensive operation (Sidoroff 2015). The new enlarged covered structure was filled with clay vessels in different stages of slow drying. Two of the three updraft kilns were firing an expanded production of large and small water jars, cooking pots, and decorative vases.

The layout of the grounds and the *chaîne opératoire* of pottery manufacture remained generally unchanged from earlier reports (Fig. 1). The factory footprint was still about 1,500 m^2 but half the property was taken over by the new enlarged covered structure, 30 m long and 24 m wide, with a clay floor. This slightly damp space was important because it offered protection from sun and wind for masses of prepared clay, thousands of vessels in various stages of slow drying, a diesel-powered pug mill, and workstations for four potters.

Large water jars, an important product at Zīzyā', are favored among populations in hot climates (Arnold 1985:23). Water jars require special treatment: many days in the roofed structure before they can be safely set outside in the sun for final drying before firing in the kiln. Through time, Amman remained the center of free resource acquisition for Zīzyā', where clay from construction sites and garbage for fuel were opportunistically collected.

To formulate the factory clay body, four different types of dry clay plus locally purchased sand and salt temper are mixed with water. Temper, either naturally included or added by the potter, modifies working, drying, and/or firing properties of a clay body. At Zīzyā', the addition of sand temper controls shrinkage as the vessel dries. Commercial salt temper interacts with calcareous clay during firing to produce the desired white exterior surfaces on vessels.

Tests conducted in the field lab assessed the attributes of each clay type in the dry, wet, and fired state (Sidoroff 2015: Table 1). Dry clay was moistened to form small (5 × 5 × 0.15 cm) test bowls, which were fired in charcoal to about 650 C°. No temper was mixed with clay samples for testing.

Dry Clay A was pale yellow (2.5 YR 7/3) and crumbly, with good plasticity when moist, and fired to reddish brown (5 YR 5/4). Dry Clay B was composed of large laminated pale yellow (2.5 YR 7/3) chunks, very sticky when moist with good plasticity, and fired to reddish brown (5 YR 5/4). Dry Clay C was yellowish red (5 YR 5/6) and very crumbly in dry state, poor plasticity, and fired to reddish brown (5 YR 5/4). Dry Clay D was light gray (2.5 YR 7/2) and very compacted when dry, poor plasticity when moist, and fired to reddish brown (5 YR 5/4). The Zīzyā' clay body formula contained double the amounts of Clay D than all other clays combined. The dense character of Clay D suggests calcareous clay possibly deposited in a past geological era during the regression of the Tethys Sea (Bender 1975: 11).

Clay body preparation at Zīzyā' begins with hosing water from a tank truck into one of two matching hydrating pools (L 1.5 × W 1.5 × D 1.3 m). Quantities of dry clay, measured with traditional archaeological field buckets (*guffahs*), are tossed into the hydrating pool. The final mix contains: 46 buckets of four different dry clay types, 20 of fine (0.25 mm) sand, and five 25 kilo bags of commercial salt. There is twice as much Clay D as the three other clay types combined (Sidoroff 2015: Table 1).

The watery clay slurry is strained from the hydrating pool into a shallow settling pond, where the slurry is left uncovered for a few days as water evaporates and the clay stiffens. Slightly dried clay from the settling pond is foot wedged to improve plasticity, blend the clay materials, and eliminate air bubbles, lumps, and pockets of salt. During foot wedging, two more bags (25 kilos each) of salt are incorporated into Zīzyā' clay body, and then the clay body is stored in the covered shed.

The quantity of commercial salt, 15 to 20% in the Zīzyā' clay body, is exceptional when compared with other of salt-tempered clay bodies (Rye 1976: 133; Rye and Evans 1976: 39). One might ask: Why would potters add salt temper to their clay? It has been assumed that salt creates the white post-fired appearance of salt-tempered vessels (London and Sinclair 1991; 'Amr 1992: 223; Rye 1976).

However, it is not the salt alone but the reaction between the salt and the calcareous clay that creates a permanent white skin. The white surface of Zīzyā' pottery is not a glaze or slip applied by the potter but develops through the addition of large quantities of salt to a calcareous clay body. At high temperatures over 1000 C°, calcite migrates to the vessel surface to form a "white firing skin" (Freestone 1997: 136).

Although there is no salty flavor to liquids or food stored in salt tempered vessels, the use of salt in formulating a clay body for water jars may be more than technological. There is a belief in the ability of salt to purify water through antibacterial qualities in the clay body and to keep it fresh tasting for a long time (Annis 1985a: 48).

During periods of intense production at Zīzyā', there were four migrant potters from Egypt, three full-time and one part-time, a Fire Master, one assistant to the potters, and a market in Saudi Arabia to accommodate the expanded production. The manager made all business decisions while seven

2. Master Potter Farouk throwing water jars.

3. Round updraft kiln during a reduction firing.

male potters met factory demands with minimum labor investment in the products. The men worked for cash in a context away from their homes, were paid in cash, and were not involved in distribution of the vessels which were standardized in size and shape.

The young Egyptian potter, Mohammed Farouk, photographed at the wheel by H.J. Franken (1986: 148), developed into a Master Potter who can throw a large water jar in one minute, about 90 standardized vessels each day (Sidoroff 2015: 99; Fig. 2). To keep the momentum during working hours, an assistant delivered fresh clay and removed finished vessels from Farouk's workstation so he need not stop working at his wheel. The entire floor of the protected shed was covered with drying vessels. From March 1 through the end of October, four potters produced about 14,000 vessels including large and small water jars, vases, and cooking pots. Standardization in vessel morphology varied less than 3% (Sidoroff 2015: 101).

The three active top loading round updraft kilns were similar in form to those found in antiquity (Zayadine 1982; Melkawi *et al.* 1994). The Zīzyā' kilns, built with concrete blocks, are set upon an elevated section of the property surrounded by wide flat spaces to place vessels before and after firing. During the reduction phase of firing, Fire Master Hamada shoveled industrial waste through the stoke hole leading to the combustion chamber of the kiln (Fig. 3).

In times of production intensity, three firings were conducted each week. On the day before a firing, the kiln was loaded through the top opening. A typical load would be about 180 large water jars and 400 smaller spouted water jars. The firing begins on the following day and consists of three phases over a 12-hour period. The first phase is the very important slow warming phase which serves to drive off water. Clay contains two types of water: capillary-bound water that partially evaporates during air drying and continues to be released during this first phase, and chemically-bound water that will be drawn off by the heat of firing at temperatures over 600 C° (1100 F°). Next, the combustion chamber was packed with fuel and set alight, the door was closed, and the pottery was slowly warmed in a reduction atmosphere from 7:00 am to 8:00 am During one firing, observations made through an opening at the top of the heating chamber confirmed all vessels within were black.

The next phase continued until 4:00 pm, as the temperature is raised with large

4. Cross-section of a water jar fragment.

pieces of fuel that maintain an oxidizing atmosphere within the kiln. This draws off the chemically-bound water in the clay body and all the pottery turns red, reflecting the presence of iron in the clay body. In the final phase, an oxidizing atmosphere is maintained until about 7:00 pm. This raises the kiln temperature to about 1200 C°. No thermocouples were available to confirm temperatures. At the end of this phase, the stoke hole is blocked until the kiln is opened the next day to ensure no cold air enters as the pottery cools down overnight. In a very successful firing most vessels have nearly white exteriors (2.5Y 8/3) with no spalls and few defects. However, from less successful firings, there are piles of wasters stacked at a distance from the kilns.

In a cross-section of a Zīzyā' fragment, the fabric shows the firing sequence (Fig. 4). The core has faint gray remains of the reduction phase when the vessel was completely black. The gray is sandwiched between yellowish red (5YR 6/8) layers from the oxidation phase when the vessel turned terracotta. On outer edges of the cross section is a fine white layer, which occurs when highest temperatures forced calcite to the surface. There are few defects and no spalls on the pottery when firing is complete but there was a pile of wasters on the factory grounds at a distance from the kilns.

A link in the Zīzyā' *chaîne opératoire* was broken in 2018. Protective attitudes in Jordanian society regarding the environment influenced a change in firing strategy. No longer could the pollution be ignored that was generated by the old kiln firings with industrial waste fuel. The government set a deadline. The factory would be closed down in 2018 unless the old kilns were replaced with environmentally friendly kilns. Hamada, Fire Master at Zīzyā' for twenty-five years, built two smaller kilns fueled with free recycled diesel fuel collected in Amman (Fig. 5).

5. New kilns fueled with recycled diesel fuel for oxidation firing only.

Due to changes with social, environmental, and technological roots, once again it seemed to be the end of pottery making at Zīzyāʾ. In July 2018 only Master Potter and Fire Master remained, Saudi Arabia is no longer the factory's strongest market, and demand in Jordan for traditional clay vessels declined.

Conclusions

Zīzyāʾ factory provided a rare opportunity to conduct ethnoarchaeological research over six years in an industrial ceramic workshop. The resulting data showed how social and cultural forces impacted continuity and change. Survival of the factory depended on the ingenuity of the family manager to access free resources, maintain a steady work force, and seek out markets. Recent change from a high intensity production mode to a diminished operation was influenced by attitudes toward environmental pollution in Jordan. This forced the factory to adopt a new firing strategy at the same time as markets abroad closed down. Whether or not there is a future for Zīzyāʾ, there are 40 years of observations by scholars to provide data to interpret the partial remains of ancient pottery workshops.

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