

### MECHANICAL ENGINEERING IN ANCIENT EGYPT, PART 102: BOWLS INDUSTRY DURING THE PREDYNASTIC TO NEW KINGDOM PERIODS

Galal Ali Hassaan\*

Emeritus Professor, Department of Mechanical Design and Production, Faculty of  
Engineering, Cairo University, Egypt.

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#### \*Corresponding Author

Galal Ali Hassaan

Emeritus Professor,  
Department of Mechanical  
Design and Production,  
Faculty of  
Engineering, Cairo  
University, Egypt.

#### ABSTRACT

The paper presents the production of bowls in ancient Egypt during a long time span from the Predynastic Period to the Period of the New Kingdom. It investigates the design features of the bowls including shape, material and decoration. It outlines also the design technologies used by the ancient Egyptians not to harm the bowl user and to strengthen its body. The present location of each bowl product is traced besides its production date if known.

**KEYWORDS:** Mechanical engineering in ancient Egypt, bowl industry, Predynastic Period, Early Dynastic Period, Old Kingdom Period, New Kingdom period, bowl features.

#### INTRODUCTION

Bowl is a domestic container used in food presentation across the human ages. It was used by the ancient Egyptians since the Predynastic periods and used different materials to produce it as will be investigated in this research paper.

Wodzinska (2005) investigated the white carinated bowls from the Giza Plateau during the 4<sup>th</sup> Dynasty. She stated that these bowls were probably the result of the demand of the local community for vessels for a specific purpose. She outline that the bowls were made of Nile or marl clay covered with a white wash with a hemispherical shape.<sup>[1]</sup> Cody (2008) studied an Old Kingdom bowl from Menden in the Brooklyn Museum discovered in 1966 and dated to

to the 5th or 6th Dynasties. He described the type of bowls discovered including pottery and copper bowls.<sup>[2]</sup> Gratien and Mielle (2012) stated that the ceramic production identified by the French Mission at Gism el-Arba were related to domestic activities such as storage containers, plates, bowls, cups and pot-stands made of Nile clay.<sup>[3]</sup> Sparavigna (2014) discussed the Egyptian faience allowing the creation of objects with glossy surfaces and various blue-green colours. She showed how faience was produced and analysed. She presented some pottery products from Naqada II period including bowls and faience bowls from the New Kingdom.<sup>[4]</sup>

Ayad (2014) studied the drilling tools and stone vessels fragments of Heit el-Ghurab in the Giza Plateau dating to the reigns of Kings Khafra and Menkaure. She presented bowls produced from limestone, gneiss, alabaster, phyllite, granite and diorite. She stated that the variations in bowl type depends on the shape of body, the rim and base.<sup>[5]</sup> Hassaan (2016) investigated the stone vessels industry during the Predynastic to Old Kingdom Periods. He presented alabaster bowls from the 1<sup>st</sup> Dynasty, alabaster, calcite and metasilt stone bowls from the 3<sup>rd</sup> Dynasty, stone bowls from the 4<sup>th</sup> and 5<sup>th</sup> Dynasties.<sup>[6]</sup> Hassaan (2016) studied the pottery industry in ancient Egypt during the Predynastic to Old Kingdom Periods. He presented some pottery bowls from Badari, Naqada I, Naqada II and 5<sup>th</sup> Dynasty.<sup>[7]</sup> Hassaan (2016) studied the faience industry in ancient Egypt during the Middle Kingdom to the Third Intermediate Period. He presented a feeding bowl from the 12<sup>th</sup>/13<sup>th</sup> Dynasties, bowl from the Middle Kingdom and bowls from the 18<sup>th</sup> and 19<sup>th</sup> Dynasties.<sup>[8]</sup>

Hassaan (2017) studied the alabaster products industry in ancient Egypt during the Predynastic to Old Kingdom Periods. He presented alabaster bowls from the 1<sup>st</sup> Dynasty, spouted bowl and re-curved bowl from the Old Kingdom.<sup>[9]</sup> Spinazzi (2020) outlined the fact that the ancient spinning bowls were produced in Egypt from the Middle Bronze Age to the Late Period. He came to the conclusion that the Egyptian spinning bowls were probably originated at least in Late Predynastic times.<sup>[10]</sup> Mourad (2021) presented the shape of bowls having round rim, point base and straight and curved sides.<sup>[11]</sup> Kato (2022) in his interpretation of the functions of the tri-lobed disc found in the tomb of Prince Sabu from the 1<sup>st</sup> Dynasty mentioned two types of bowls when talking about the ways of heating used in the brewery process.<sup>[12]</sup>

### Bowls Production during the Predynastic Period

The latest cultures of the Predynastic Period of ancient Egypt covers a time span from 4400 BC (Badarian. Culture) to 3000 BC (Naqada III culture).<sup>[13]</sup> This history era is a continuation of the ages of pottery bowls. Some of the features of the bowls industry during the Predynastic Periods are examined through the following examples:

- The first example is a pottery dual connected bowl from the Badarian Period of ancient Egypt (4500-4000 BC) of 110 and 113 mm diameters and shown in Fig.1.<sup>[14]</sup> This bowl is more than 6000 years old produced from the Nile clay and has some outstanding features:
  - The design presents dual bowls with one flat base.
  - The cavities may be connected to each other through the horizontal neck or blocked through the same neck.
  - The rim of both bowls are rounded.
  - The inclination of the rim plane is different for both bowls.
  - The sides are of the convex type.



**Figure 1: Dual connected pottery bowl from Badarian Period.**<sup>[14]</sup>

- The second example is a pottery bowl from the Badarian and Early Naqada I Period of ancient Egypt (4500-3800 BC) in display in the Metropolitan Museum of Art at New York and shown in Fig.2.<sup>[15]</sup> The bowl has convex sides, rounded base and flat rim. The top part is blacked using firing during the production process.



**Figure 2: Pottery bowl from Badarian/Naqada I Periods.**<sup>[15]</sup>

- The third example is a pottery bowl from the Naqada I/Naqada II Periods of ancient Egypt (4000-3800 BC) sold by Christies in London on 15 April 2015 for GBP 2250 and shown in Fig.3.<sup>[16]</sup> The bowl has straight sides, unique base of four rounded feet and rounded rim. The top part is blacked using firing during the production process.



**Figure 3: Pottery bowl from Naqada I/Naqada II Periods.<sup>[16]</sup>**

The fourth example is a pottery bowl from the Naqada I/Naqada II Periods of ancient Egypt (4000-3400 BC) in display in the Cleveland Museum of Art and shown in Fig.4.<sup>[17]</sup> The bowl has straight V-shaped sides, flat base and rounded rim. It was decorated by white lines drawn on the outside surface taking a zigzag shape bounded by vertical lines.



**Figure 4: Pottery bowl from Naqada I/Naqada II Periods.<sup>[17]</sup>**

- The fifth example is a pottery bowl from the Naqada I/Naqada III Periods of ancient Egypt (3850-2960 BC) displayed by Alamy and shown in Fig.5.<sup>[18]</sup> The bowl has convex sides, flat base and rounded rim. It was decorated by white 3D bands on the outside surface taking a zigzag shape and filled with more lighter small objects. What is amazing is that those objects didn't fall down after more than 5000 years.



**Figure 5: Pottery bowl from Naqada I/Naqada III Periods.<sup>[18]</sup>**

- The sixth example is a pottery bowl from the Naqada I/Naqada III Periods of ancient Egypt (3850-2960 BC) displayed by Alamy and shown in Fig.6.<sup>[19]</sup> The bowl has flat/convex sides, round base and flat rim. It was decorated by polishing its external surfaces.



**Figure 6: Pottery bowl from Naqada I/Naqada III Periods.<sup>[19]</sup>**

- The seventh example is a pottery bowl with long legs from the Naqada I/Naqada II Periods of ancient Egypt (3600-3400 BC) in display in the Metropolitan Museum of Art and shown in Fig.7.<sup>[20]</sup> The bowl has flat sides, four round legs forming the base and round rim. It was decorated by white lined scenes on its internal surface and making its top part having red color while the bottom part including the legs with pink color. The ancient Egyptian pottery product designer designed this bowl to simulate a cow udder with four teats. It is a mystery with more than 7000 years old. It reflects the thinking of the genius Egyptians at those very early times.
- The eighth example is a pottery bowl with human feet from the Naqada I Period (3900-3650 BC) in display in the Metropolitan Museum of Art and shown in Fig.8.<sup>[21]</sup> The bowl has convex sides, two human feet representing a flat base and round rim. It has a uniform



red color for all the surfaces. Again this design reflects the generosity of the ancient Egyptian craftsman. He made the bowl simulates a standing man.



**Figure 7: Pottery bowl from Naqada I/Naqada II Periods.**<sup>[20]</sup>



**Figure 8: Pottery bowl from Naqada I Period.**<sup>[21]</sup>

- The ninth example is a pottery bowl having a frog shape from the Naqada III Period (3000 BC) displayed by Alamy and shown in Fig.9.<sup>[22]</sup> The bowl has convex sides, flat base and flat necked rim. It simulates a frog and had two hanging or carrying hands. The mystery here is to find an adhesive that could stick the hands to the convex surface of the bowl and survive for more than 5000 years. This is a positive sign of the high technology of the adhesives industry in ancient Egypt.



**Figure 9: Pottery bowl from Naqada III Period.**<sup>[22]</sup>

### **Bowls Production during the Early Dynastic Period**

The Early Dynastic Period of ancient Egypt comprises the 1<sup>st</sup> and 2<sup>nd</sup> Dynasties over a time span from 3150-2686 BC.<sup>[23]</sup> This history era is the era of emerging the stone bowls. Some of the features of the bowls industry during the Early Dynastic Period are examined through the following examples:

- The first example is a 150 mm diameter slate bowl from the 1st Dynasty (3100-2900 BC) in display in the Metropolitan Museum of Art and shown in Fig.10.<sup>[24]</sup> It is exactly rounded with convex sides, round rim and flat base with a flange.
- The second example is a 125 mm length calcite bowl from the 1<sup>st</sup>/2<sup>nd</sup> Dynasties (3050-2687 BC) displayed by Alamy and shown in Fig.11.<sup>[25]</sup> It is exactly rounded with convex sides, round rim and flat base with an integrated spouse with rounded tip. All the corners are filleted to avoid ant sharp edges in an amazing engineering tradition born in ancient Egypt more than 5000 years ago.



**Figure 10: Slate bowl from the 1<sup>st</sup> Dynasty.<sup>[24]</sup>**



**Figure 11: Calcite bowl from 1<sup>st</sup>/2<sup>nd</sup> Dynasties.<sup>[25]</sup>**

- The third example is a 240 mm height alabaster bowl from the 1<sup>st</sup>/2<sup>nd</sup> Dynasties (3000-2650 BC) sold by Christies in London on 2 April 2014 for 6188 US \$ and shown in Fig.12.<sup>[26]</sup> It is exactly rounded with convex sides, round rim and flat base.
- The fourth example is a 130 mm height alabaster bowl from the 1<sup>st</sup> Dynasty inscribed for Djer, the 3<sup>rd</sup> King (3000-2960 BC) in display in Rijks Museum at Leiden and shown in Fig.13.<sup>[9]</sup> It is exactly rounded with convex sides, round rim and flat base. The bowl was inscribed by the Cartouche of King Djer.



**Figure 12: Alabaster bowl from the 1<sup>st</sup>/2<sup>nd</sup> Dynasties.<sup>[26]</sup>**



**Figure 13: Alabaster bowl from 1<sup>st</sup> Dynasty.<sup>[9]</sup>**

- The fifth example is a 75 mm height diorite bowl from the 1<sup>st</sup>/2<sup>nd</sup> Dynasties (3000-2700 BC) sold by Keller Auctioneers in 30 March 2017 for 1723 US \$ and shown in Fig.14.<sup>[27]</sup> It is exactly rounded with convex sides, round thick rim and flat base.
- The sixth example is an alabaster bowl from the 1st Dynasty inscribed for Semerkhet, one of the Kings of the 1<sup>st</sup> Dynasty (2920-2912 BC) in display in National Archaeological Museum at France and shown in Fig.15.<sup>[28]</sup> It is exactly rounded with convex sides, round rim and flat base. The bowl was inscribed by a hieroglyphic text belonging to King Semerkhet.



**Figure 14: Diorite bowl from the 1<sup>st</sup>/2<sup>nd</sup> Dynasties.<sup>[27]</sup>**



**Figure 15: Alabaster bowl from 1<sup>st</sup> Dynasty.<sup>[28]</sup>**

- The seventh example is a 220 mm diameter diorite bowl from the 2<sup>nd</sup> Dynasty (2750-2649 BC) in display in Metropolitan Museum of Art and shown in Fig.16.<sup>[29]</sup> It is exactly rounded with convex sides, round rim and flat base.
- The eighth example is a 190 mm diameter alabaster bowl from the 2<sup>nd</sup> Dynasty (2750-2649 BC) in display in Metropolitan Museum of Art and shown in Fig.17.<sup>[30]</sup> It is exactly rounded with convex sides, round large rim and flat base.



**Figure 16: Diorite bowl from the 2<sup>nd</sup> Dynasty.<sup>[29]</sup>**



**Figure 17: Alabaster bowl from 2<sup>nd</sup> Dynasty.<sup>[30]</sup>**

### **Bowls Production during the Old Kingdom**

The Old Kingdom of ancient Egypt comprises the 3<sup>rd</sup> to 6<sup>th</sup> Dynasties over a time span from 2686-2181 BC.<sup>[31]</sup> This history era is the era of practicing the production of both pottery and



stone bowls. Some of the features of the bowls industry during the Old Kingdom are examined through the following examples:

- The first example is a 111 mm diameter stone bowl from the 3<sup>rd</sup>/6<sup>th</sup> Dynasties (2686-2181 BC) in display in Saint Louis Museum of Art and shown in Fig.18.<sup>[32]</sup> It has convex sides, round rim with short neck and small flat base.
- The second example is a gneiss bowl from the 3<sup>rd</sup> Dynasty (2686-2613BC) in display in Petrie Museum and shown in Fig.19.<sup>[33]</sup> It has a convex sides, round rim and flat cylindrical base.



**Figure 18: Stone bowl from the 3<sup>rd</sup>/6<sup>th</sup> Dynasties.**<sup>[32]</sup>



**Figure 19: Gneiss bowl from 3<sup>rd</sup> Dynasty.**<sup>[33]</sup>

- The third example is a pottery bowl from the 3<sup>rd</sup>/6<sup>th</sup> Dynasties (2686-2181 BC) in display in Petrie Museum and shown in Fig.20.<sup>[34]</sup> It has convex sides, round rim with small flat base. The purpose of this bowl was to be used as a letter from somebody called 'Qau' from the Old Kingdom to his dead parents (mother and father).
- The fourth example is a 114 mm diameter granodiorite bowl from the 3<sup>rd</sup>/6<sup>th</sup> Dynasties (2649-2100 BC) in display in the Metropolitan Museum of Art and shown in Fig.21.<sup>[35]</sup> It has convex sides, large round rim and flat base.



**Figure 20: Pottery bowl from the 3<sup>rd</sup>/6<sup>th</sup> Dynasties.**<sup>[34]</sup>



**Figure 21: Granodiorite bowl from 3<sup>rd</sup>/6<sup>th</sup> Dynasties.**<sup>[35]</sup>

- The fifth example is a 208 mm diameter pottery bowl from the 3<sup>rd</sup>/6<sup>th</sup> Dynasties (2640-2100BC) in display in the Metropolitan Museum of Art and shown in Fig.22.<sup>[36]</sup> It has straight sides, flat rim and a flat base.
- The sixth example is a 200 mm diameter diorite bowl from the 4<sup>th</sup> Dynasty (2613-2494 BC) in display in the Phoebe Hearst Museum of Anthropology, University of California, Berkeley and shown in Fig.23.<sup>[37]</sup> It has convex sides, discrete five parts rims bent inside and a flat base. This is one of the master pieces reflecting the high technology used by the ancient Egyptians to produce difficult designs like this one using hard rocks.



**Figure 22: Pottery bowl from the 3<sup>rd</sup>/6<sup>th</sup> Dynasties.<sup>[36]</sup>**



**Figure 23: Diorite bowl from 4<sup>th</sup> Dynasty.<sup>[37]</sup>**

- The seventh example is an alabaster spouted bowl from the 4<sup>th</sup>/6<sup>th</sup> Dynasties (2600-2181 BC) sold by Christies in London on 1st October 2014 for 7338 US \$ and shown in Fig.24.<sup>[38]</sup> It has a hemi-spherical shape, round rim and a U-shaped spout integrated with the bowl body ending at its rim.
- The eighth example is a 94 mm diameter basalt cylindrical bowl from the 4<sup>th</sup> Dynasty, reign of King Menkaura (2490-2472 BC) in display in the Museum of Fine Arts and shown in Fig.25.<sup>[39]</sup> It has thick walls with flat square rim with fillets at its three corners and flat base with fillet.



**Figure 24: Alabaster bowl from the 4<sup>th</sup>/6<sup>th</sup> Dynasties.<sup>[38]</sup>**



**Figure 25: Diorite bowl from 4<sup>th</sup> Dynasty.<sup>[39]</sup>**

- The ninth example is a 212 mm diameter alabaster bowl from the 4<sup>th</sup>/5<sup>th</sup> Dynasties (2500-2400 BC) in display by the Metropolitan Museum of Art and shown in Fig.26.<sup>[40]</sup> It has a convex side, round re-curved rim and a flat base.
- The tenth example is a 170 mm diameter pottery bowl from the 5<sup>th</sup>/6<sup>th</sup> Dynasties (2465-2150 BC) in display in the Metropolitan Museum of Art and shown in Fig.27.<sup>[41]</sup> It has an shallow convex sides, round re-curved rim and a flat base.



**Figure 26: Alabaster bowl from the 4<sup>th</sup>/5<sup>th</sup> Dynasties.**<sup>[40]</sup>



**Figure 27: Pottery bowl from 5<sup>th</sup>/6<sup>th</sup> Dynasties.**<sup>[41]</sup>

### **Bowls Production during the Middle Kingdom**

The Middle Kingdom of ancient Egypt comprised the 11<sup>th</sup> to 13<sup>th</sup> Dynasties over a time span from 2055-1650 BC.<sup>[42,43]</sup> This history era is the era of practicing the production of both pottery and stone bowls plus introducing the faience bowls. Some of the features of the bowls industry during the Middle Kingdom are examined through the following examples:

- The first example is a pottery bowl from the 11<sup>th</sup> Dynasty (2130-1990 BC) in display Petrie Museum and shown in Fig.28.<sup>[44]</sup> It is exactly rounded with convex sides, round rim and round base.
- The second example is a 176 mm diameter pottery bowl from the 11<sup>th</sup>/12<sup>th</sup> Dynasties (2130-1800 BC) in display by the British Museum and shown in Fig.29.<sup>[45]</sup> It is exactly rounded with convex sides, round vertical rim and flat base. It is decorated by crossed straight bands forming rhombi with white borders. The rim was differently decorated. What is amazing is that those decorations resisted all surrounding environments for more than 4000 years.

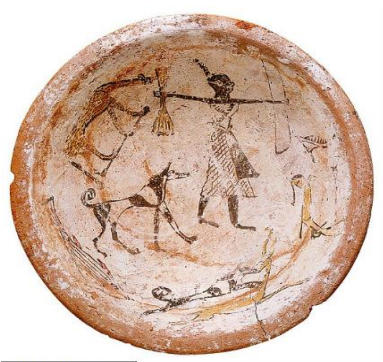


**Figure 28: Pottery bowl from the 11<sup>th</sup> Dynasty.<sup>[44]</sup>**

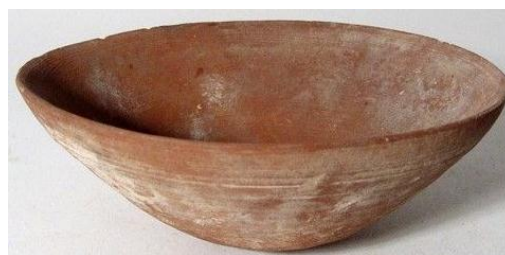


**Figure 29: Pottery bowl from 11<sup>th</sup>/12<sup>th</sup> Dynasties.<sup>[45]</sup>**

- The third example is a 167 mm diameter pottery bowl from the 11<sup>th</sup> Dynasty (2124-1981 BC) in display in the Metropolitan Museum of Art and shown in Fig.30.<sup>[46]</sup> It is exactly rounded with shallow convex sides, flat rim and round base. It was decorated by a colored hunting scene presenting a Nubian hunter hunting animals using his a spear and followed by his dog.
- The fourth example is a 139 mm diameter pottery bowl from the 11<sup>th</sup>/12<sup>th</sup> Dynasties (2081-1630 BC) displayed by Live Auctioneers for sale on 10<sup>th</sup> December 2011 with an estimated price of 500-600 US\$ and shown in Fig.31.<sup>[47]</sup> It is exactly rounded with straight sides, round rim and flat base.



**Figure 30: Pottery bowl from the 11<sup>th</sup> Dynasty.<sup>[46]</sup>**



**Figure 31: Pottery bowl from 11<sup>th</sup>/12<sup>th</sup> Dynasties.<sup>[47]</sup>**

- The fifth example is a faience bowl from the Middle Kingdom (2055-1650 BC) displayed by Lot-Art Auctioneers for sale at London on 25<sup>th</sup> July 2021 and shown in Fig.32.<sup>[48]</sup> It is exactly rounded with shallow convex sides, flat rim and round base. It was decorated by a colored scene presenting an Egyptian tilapia fish drawn using black pigment on a blue background and a yellow rim. What is amazing here is the technology used by the ancient Egyptian to keep a paint standing for about 4000 years without deterioration.



- The sixth example is a 122 mm diameter pottery bowl from the Middle Kingdom (2050-1710 BC) in display by the British Museum and shown in Fig.33.<sup>[49]</sup> It is exactly rounded with convex sides, round re-curved rim and small flat (or round) base.
- The seventh example is a 90 mm diameter alabaster bowl from the Middle Kingdom (2050-1710 BC) sold in Barcelona by Barnebys Auctioneers for sale at London on 19<sup>th</sup> December 2021 for 905 US \$ and shown in Fig.34.<sup>[50]</sup> It is exactly rounded with convex sides, round triangular prism rim and flat base.
- The eighth example is a 60 mm diameter cosmetic stone bowl from the Middle Kingdom (2030-1640 BC) in display by the Pushkin Museum of Art at Moscow and shown in Fig.35.<sup>[51]</sup> It is exactly rounded with convex sides, round triangular prism rim and flat base.



**Figure 32: Faience bowl from the Middle Kingdom.<sup>[48]</sup>**



**Figure 33: Pottery bowl from the Middle Kingdom.<sup>[49]</sup>**

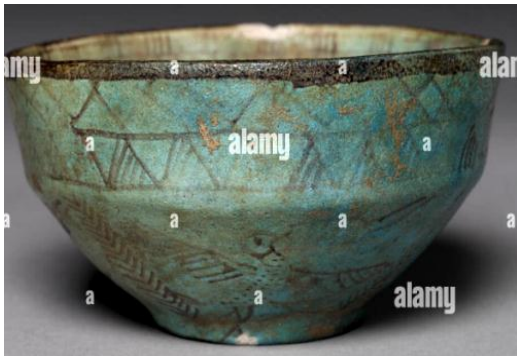


**Figure 34: Alabaster bowl from the Middle Kingdom.<sup>[50]</sup>**



**Figure 35: Cosmetic stone bowl from the Middle Kingdom.<sup>[51]</sup>**

- The ninth example is a 108 mm diameter faience bowl from the 12<sup>th</sup> Dynasty (1980-1801 BC) displayed by Alamy and shown in Fig.36<sup>[52]</sup>. It is exactly rounded with vertical and slightly convex sides, round-black lip rim and flat base. It was decorated by black zigzag lines bounded by black bordered bands.
- The tenth example is a 97 mm diameter anhydrite bowl from the 12<sup>th</sup>/13<sup>th</sup> Dynasties (1878-1749 BC) in display by the Metropolitan Museum of Art and shown in Fig.37<sup>[53]</sup>. It is exactly rounded with convex sides, round rim and flat base.



**Figure 36: Faience bowl from the 12<sup>th</sup> Dynasty.**<sup>[52]</sup>



**Figure 37: Anhydrite bowl from the 12<sup>th</sup>/13<sup>th</sup> Dynasties.**<sup>[53]</sup>

### **Bowls Production during the New Kingdom**

The New Kingdom of ancient Egypt comprised the 18<sup>th</sup> to 20<sup>th</sup> Dynasties over a time span from 1550-1069 BC.<sup>[54]</sup> This history era is the era of introducing new materials for the production of bowls such as glass and bronze. Some of the features of the bowls industry during the Middle Kingdom are examined through the following examples:

- The first example is a 280 mm diameter faience bowl from the 18<sup>th</sup> Dynasty (1550-1458 BC) in display Metropolitan Museum of Art and shown in Fig.38.<sup>[55]</sup> It is exactly rounded with convex sides, flat rim and small flat base. It was decorated by floral scenes covering the whole interior of the bowl drawn with a black pigment.
- The second example is a 140 mm diameter faience bowl from the 18<sup>th</sup> Dynasty (1550-1420 BC) in display by the Walters Art Museum at Baltimore and shown in Fig.39<sup>[56]</sup>. It is exactly rounded with convex sides, flat rim and flat base. It was decorated by a scene of two Egyptian tilapia fish with floral around them covering the whole interior of the bowl drawn with a black pigment.

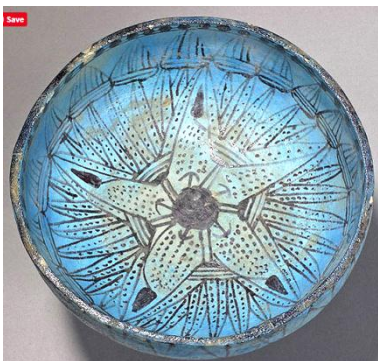


**Figure 38: Faience bowl from the 18<sup>th</sup> Dynasty.<sup>[55]</sup>**



**Figure 39: Faience bowl from the 18<sup>th</sup> Dynasty.<sup>[56]</sup>**

- The third example is a faience bowl from the 18<sup>th</sup> Dynasty (1550-1292 BC) in display by the Louvre Museum and shown in Fig.40.<sup>[57]</sup> It is exactly rounded with convex sides, flat rim and flat base. It was decorated by a five waterlily scene covering the whole interior of the bowl drawn with a black pigment and emerging from a central black disc.
- The fourth example is a 127 mm diameter faience bowl from the 18<sup>th</sup> Dynasty (1550-1292 BC) in display by the British Museum and shown in Fig.41.<sup>[58]</sup> It is exactly rounded with convex sides, flat rim and small flat base. It was decorated by fish and bird scene covering the whole interior of the bowl drawn with a black pigment.



**Figure 40: Faience bowl from the 18<sup>th</sup> Dynasty.<sup>[57]</sup>**

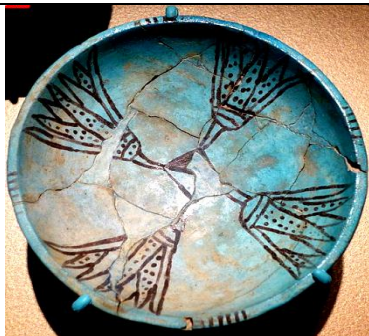


**Figure 41: Faience bowl from the 18<sup>th</sup> Dynasty.<sup>[58]</sup>**

- The fifth example is a faience bowl from the 18<sup>th</sup> Dynasty, reigns of Pharaohs Thutmose III to Amenhotep II (1479-1400 BC) in display by the Brooklyn Museum and shown in Fig.42.<sup>[59]</sup> It is exactly rounded with convex sides, flat rim and flat base. It was decorated by a four lotus scene covering the whole interior of the bowl drawn with a black pigment and emerging from a central non-uniform geometric shape.



- The sixth example is a 220 mm diameter bronze votive bowl from the 18<sup>th</sup> Dynasty (1479-1425 BC) in display by the Metropolitan Museum of Art and shown in Fig.43.<sup>[60]</sup> It is exactly rounded with slight concave sides, round rim and flat base. It had no decorations.
- The seventh example is a faience bowl from the 18<sup>th</sup> Dynasty (1425-1353 BC) in display by the Egyptian Museum of Turin and shown in Fig.44.<sup>[61]</sup> It is exactly rounded with convex sides, flat rim and small flat base. It was decorated by a lotus scene covering the whole interior of the bowl drawn with a black pigment and emerging from a central uniform circle.
- The eighth example is a 185 mm diameter alabaster bowl from the 18<sup>th</sup> Dynasty, reigns of Pharaohs, Amenhotep III and Akhenaten (1391-1337 BC) displayed by Alamy and shown in Fig.45.<sup>[62]</sup> It is exactly rounded with straight vertical sides strengthened by three ribs, round rim and flat base with concave foot and round flange. It had no decorations. This unique product reflects the high technology used by the ancient Egyptians in product design more than 3300 years ago.



**Figure 42: Faience bowl from the 18<sup>th</sup> Dynasty.<sup>[59]</sup>**



**Figure 43: Bronze bowl from the 18<sup>th</sup> Dynasty.<sup>[60]</sup>**



**Figure 44: Faience bowl from the 18<sup>th</sup> Dynasty.<sup>[61]</sup>**



**Figure 45: Alabaster bowl from the 18<sup>th</sup> Dynasty.<sup>[62]</sup>**



- The ninth example is a 62.2 mm diameter limestone bowl from the reign of Pharaoh Amenhotep III of the 18<sup>th</sup> Dynasty (1388-1350 BC) displayed by Alamy and shown in Fig.46.<sup>[63]</sup> It is exactly rounded with concave sides, flat filleted rim and flat base. It was not decorated.
- The tenth example is an alabaster bowl from the reign of Pharaoh Akhenaten of the 18<sup>th</sup> Dynasty (1351-1334 BC) in display by Rijks Museum at Leiden and shown in Fig.47.<sup>[64]</sup> It is exactly rounded with two hanging hands, convex sides, round rim and small flat base. It was inscribed in black pigment by three Cartouches for Pharaoh Akhenaten, his wife Nefertiti and Deity Aton.



**Figure 46: Limestone bowl from the 18<sup>th</sup> Dynasty.<sup>[63]</sup>**



**Figure 47: Alabaster bowl from the 18<sup>th</sup> Dynasty.<sup>[64]</sup>**

- The eleventh example is a 140 mm diameter pottery bowl of Pharaoh Tutankhamun of the 18<sup>th</sup> Dynasty (1336-1327 BC) in display by the Metropolitan Museum of Art and shown in Fig.48<sup>[65]</sup>. It is exactly rounded with convex sides, flat filleted rim and flat base. It was decorated through painting a scene of vertical strips between horizontal bands using a light blue pigment.
- The twelfth example is a faience bowl from the 19<sup>th</sup> Dynasty (1300 BC) in display by Venice Clay Artists and shown in Fig.49<sup>[66]</sup>. It is exactly rounded convex sides, round rim and flat base. It was decorated by a scene drawn using a black pigment for a singer in a boat with plants around here on the whole inside surface of the bowl while decorating the rim by a broken line. An outstanding example of the product design in ancient Egypt more than 3300 years ago.



**Figure 48: Pottery bowl from the 18<sup>th</sup> Dynasty.<sup>[65]</sup>**



**Figure 49: Faience bowl from the 19<sup>th</sup> Dynasty.<sup>[66]</sup>**

- The thirteenth example is a 121 mm diameter faience marsh bowl from the 19<sup>th</sup> Dynasty (1295-1186 BC) in display by the Metropolitan Museum of Art and shown in Fig.50.<sup>[67]</sup> It is exactly rounded with convex sides, round rim and big flat base. It was decorated by a scene drawn using a black pigment for a three levels of plant leaves on the whole inside surface of the bowl while decorating the rim by discrete bits.
- The fourteenth example is a blue-glass bowl from the 19<sup>th</sup>/20<sup>th</sup> Dynasties (1295-1070 BC) displayed by Alamy and shown in Fig.51.<sup>[68]</sup> It is exactly rounded with convex sides, round rim and small disc-shaped flat base. The rim was colored by an orange pigment.



**Figure 50: Faience bowl from the 19<sup>th</sup> Dynasty.<sup>[67]</sup>**



**Figure 51: Glass bowl from the 19<sup>th</sup>/20<sup>th</sup> Dynasties.<sup>[68]</sup>**

- The fifteenth example is a blue faience bowl from the 19<sup>th</sup> Dynasty (1292-1077 BC) in display by the British Museum and shown in Fig.52.<sup>[69]</sup> It is exactly rounded with convex sides, flat rim and flat base. It was decorated by a scene drawn using a black pigment for lotus flowers on the whole inside surface of the bowl while painting the rim by a black pigment.



Figure 52: Faience bowl from the 19<sup>th</sup> Dynasty.<sup>[69]</sup>

## CONCLUSION

- The paper presented the production of bowls in ancient Egypt during a long time span from the Predynastic Period to the New Kingdom.
- The ancient Egyptians were pioneers in product design where they invented non-traditional shapes with smooth surfaces without any sharp corners.
- They produced round shapes to be exactly round such that one says they used CNC machines.
- They used pottery as raw material for bowl production during the Predynastic, Early Dynastic, Old Kingdom, Middle Kingdom and New Kingdom.
- They used stone as raw material for bowl production during the 1<sup>st</sup> Dynasty, 2<sup>nd</sup> Dynasty, Old Kingdom, Middle Kingdom and New Kingdom.
- They used faience as raw material for bowl production during the Middle Kingdom and New Kingdom.
- They used glass as raw material for bowl production during the New Kingdom.
- They used bronze as raw material for bowl production during the 18<sup>th</sup> Dynasty of the New Kingdom.
- They produced bowls with convex sides, flat sides, combined convex-flat sides and V-shaped sides.
- They produced bowls with flat, round and turned out rims.
- They produced bowls with flat and round base.
- They produced bowls with short and long feet and short necks.
- They designed and produced dual-cavity pottery bowls during the Predynastic Period.
- They produced pottery bowls with two colors controlled by the firing process.

- They produced bowls with discrete feet during the Predynastic Period.
- They produced bowls with decorated outside surfaces during the Predynastic Period.
- They produced bowls with 3D decorations on the outside surface during the Predynastic Period.
- They produced bowls with polished outside surfaces during the Predynastic Period.
- They produced bowls with human feet simulation during Naqada I Period and with feet simulating animal four-teats during Naqada I/Naqada II Period.
- They produced bowls simulating frogs during Naqada III Period.
- They produced spouted stone bowls since the Early Dynastic Period.
- They produced alabaster bowls since the 1<sup>st</sup> Dynasty labeled by Royal Cartouches and inscribed by a hieroglyphic text down to the 18<sup>th</sup> Dynasty.
- They produced alabaster bowls during the Old Kingdom with long spouts.
- They could produce bowls with difficult shapes during the 4<sup>th</sup> Dynasty using hard rocks.
- They produced pottery and alabaster bowls with re-curved rims during the Old and Middle Kingdoms.
- They decorated their pottery bowls on their outside and/or inside surfaces during the Middle Kingdom.
- They decorated faience bowls using various scene designs from their surrounding nature using black pigment during the 18<sup>th</sup> and 19<sup>th</sup> Dynasties.
- They used ribs to strengthen the bowl sides during the 18<sup>th</sup> Dynasty.

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**BIOGRAPHY****Galal Ali Hassaan**

- Emeritus Professor of System Dynamics and Automatic Control.
- Has got his B.Sc. and M.Sc. from Cairo University in 1970 and 1974 respectively.
- Has got his Ph.D. in 1979 from Bradford University, UK under the supervision of Late Prof. John Parnaby.
- Now with the Faculty of Engineering, Cairo University, EGYPT.
- Research on Automatic Control, Mechanical Vibrations, Mechanism Synthesis and History of Mechanical Engineering.
- Published about 295 research papers in international journals and conferences.
- Author of books on Experimental Systems Control, Experimental Vibrations and Evolution of Mechanical Engineering.
- Member of the Editorial Board of a number of International Journals including the WJERT journal.
- Reviewer in some international journals.