



MECHANICAL ENGINEERING IN ANCIENT EGYPT, PART 70: UTENSILS INSCRIPTION

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ABSTRACT

The objective of this paper is to investigate the development of mechanical engineering in ancient Egypt through the study of utensils inscriptions during a time span from Naqada III to Late Periods. This study covers the different types of inscribed utensils produced during this period and how the ancient Egyptians registered their information on objects sustained for thousands of years. The material, period, height, diameter, inscription type and present location are all outlined.

KEYWORDS: Mechanical engineering history, ancient Egypt, utensils inscriptions, Naqada III to Late Period.

This is the 70th part in a series aiming at investigating the mechanical engineering technology in ancient Egypt. It focuses on the production and use of the different types of utensils and how the ancient Egyptians used them as media for writing and authorizing information.

Aston, 2004 studied the amphorae of the New Kingdom of ancient Egypt. He presented an inscribed amphorae for Pharaoh Thutmose I, Thutmose III, Amenhotep II (from the 18th Dynasty) and Merenptah and Seti II (from the 19th Dynasty).^[1] Rafaele, 2005 presented a fragment from a stone vessel inscribed with the name of goddess Bastet using a hieroglyphic script of 10 mm height. The fragment was a private collection of Mr. Smith from USA.^[2] Nicholson, 2006 outlined that there were two pieces of glass beads with inscriptions mentioning Queen Hatshepsut and her Steward Senenmut. He presented a chalice in display

in the Staatliche Sammlung Ägyptischer Kunst, Munich and inscribed by the Cartouche of Pharaoh Thutmose III with his name inscribed using a dark blue hieroglyphic script.^[3] Sapsford, 2008 in her Ph.D. thesis presented four canopic jars of Neskhn from the 21st Dynasty inscribed on their shoulders.^[4]

Wahlberg, 2012 in her MA thesis about wine jars presented a wine jar image from the tomb of Pharaoh Tutankhamun in display in the Ashmolean Museum of Oxford. She outlined that the text in most cases was written on the shoulder of the jar.^[5] Reeves, 2013 in his research paper about Amenhotep, the Overseer of Builders of Amun during the 18th Dynasty presented a set of four canopic jars for Amenhotep. The four jars are in display in the Oriental Institute Museum of Chicago and inscribed in four bounded columns using the hieroglyphic script.^[6]

Lubezynska, 2014 in her research paper about the inscribed vessels represented in the Chapel of Hatshepsut at Deir el-Bahari presented a number of images for vessels inscribed on their external body and on the cover. She presented also an actual vessel inscribed for Lady Pharaoh.^[7] Woods, Teeter and Emberling, 2015 in their book about the visible language presented sherds with pot marks from the 1st Dynasty, inscribed vessel from the 1st Dynasty, inscribed clay vessel from the First intermediate Period with hieroglyphic script on the whole surface.^[8]

Hassaan, 2016 presented an alabaster inscribed jar from the 5th Dynasty belonging to King Unas in display in the Louvre Museum and an alabaster inscribed vessels for King Pepi I from the 6th Dynasty.^[9] Hassaan, 2017 investigated the alabaster products in ancient Egypt during the era from Predynastic to the end of the New Kingdom. He presented an inscribed vessels from the Early Dynastic,^[10] inscribed canopic jar from the 12th Dynasty, inscribed amphora, goblet, vase, drinking cup, perfume jar from the 18th and 19th Dynasties.^[11] Wikipedia, 2018 wrote an article about canopic jar and presented an alabaster canopic jar of Neskhn, wife of Pinedjem II, the High Priest of Amun at Thebes from 990 to 969 BC during the 21st Dynasty. The jars were inscribed on their shoulder within a rectangular boundary.^[12] Wikipedia, 2018 wrote an article about the ancient Egyptian pottery. Among the many examples they presented was a pottery vessel from the 1st Dynasty inscribed for King Aha.^[13]

Jars Inscriptions

The genius ancient Egyptians used all the available media in their hands to record their knowledge in a sustainable way that could withstand the environmental effects for thousands of years. One of this media is jar production where they presented wonderful inscriptions suitable for all ages since they followed high level of arts and production technology as will be illustrated through the following examples over a wide era of time:

- The first example is a 153 mm height and 158 mm diameter alabaster jar inscribed for King Pepi I from the 6th Dynasty of the Old Kingdom (2331-2287 BC) in display in the British Museum of London and shown in Fig.1.^[14] The inscriptions were applied using a hieroglyphic script and a black ink within a rectangular boundary.
- The second example is a 150 mm height and 130 mm maximum diameter alabaster ointment jar inscribed for King Pepi I in display in the Metropolitan Museum of Art at NY and shown in Fig.2.^[15] The jar was inscribed by a hieroglyphic script for a text written inside the King's Cartouche and around it. Most probably, the lid is also inscribed by a single line hieroglyphic script.



Fig. 1: Alabaster jar of King pepi I.^[14]



Fig. 2: Alabaster ointment jar of King Pepi I.^[15]

- The third example is a 394 mm height and 216 mm maximum diameter limestone canopic jar inscribed for Lady Senebtisi from the 12th Dynasty (1938-1759 BC) in display in the Brooklyn Museum at NY and shown in Fig.3^[16]. The jar was inscribed by a hieroglyphic script for a funerary text on the shoulder within a rectangular boundary written in three bounded adjacent columns using black ink.

- The fourth example is a 355 mm height alabaster canopic jar inscribed for Princess Sithathoryunet, daughter of King Senusret II of the 12th Dynasty (1897-1878 BC) in display in the Metropolitan Museum of Art at NY. The jar inscription is shown in Fig.4^[17] where it was inscribed by a hieroglyphic script for a funerary text on the shoulder written in four bounded adjacent columns.



Fig. 3: Canopic jar of Senebtisi from the 12th Dynasty.^[16]



Fig. 4: Canopic jar of Sithathoryunet from the 12th Dynasty.^[17]

- The fifth example is a 40 mm height and 42 mm maximum diameter obsidian jar inscribed for King Merneferre Aya from the 13th Dynasty (1700-1676 BC) in display in the Metropolitan Museum of Art at NY and shown in Fig.5.^[18] The spherical jar was inscribed using a hieroglyphic script written in two columns within a rectangular borders including the King's Cartouche.
- The sixth example is a jar lid inscribed for King Ini I from the 13th Dynasty (1677-1675 BC) in display in the Los Angeles Country Museum of Art at Los Angeles, USA and shown in Fig.6.^[19] The lid was inscribed using a hieroglyphic text written in single column within the Cartouche of the Pharaoh.



Fig. 5: Jar of King Aya from the 12th Dynasty.^[18]



Fig. 6: Jar lid of King Ini I from the 13th Dynasty.^[19]

- The seventh example is a 330 mm height and 177.8 mm maximum diameter limestone canopic jar from the 18th Dynasty (1570-1085 BC) shown in Fig.7.^[20] The carved hieroglyphic inscription was written in three bounded columns separated by two parallel lines.
- The eighth example is a 304 mm height and 190 mm maximum diameter terracotta canopic jar inscribed for Amenhotep, the Overseer of the Builders of Amun from the 18th Dynasty (1550-1292 BC) in display in the Metropolitan Museum of Art and shown in Fig.8.^[21]



Fig. 7: Canopic jar from the 18th Dynasty.^[20]



Fig. 8: Canopic jar of Amenhotep from the 18th Dynasty.^[21]

The jar was inscribed using a hieroglyphic script with funerary text written in four bounded columns.

- The ninth example is an alabaster kohl jar of Pharaoh Hatshepsut from the 18th Dynasty (1492-1477 BC) in display in the Metropolitan Museum and shown in Fig.9.^[22] It has a unique design where seven circular holes were drilled in the alabaster block and the outside surface was carved to take a have cylinder around each hole. The jar was inscribed inside a rectangular vertical frame by the Cartouche of the Pharaoh with hieroglyphic script above and below the Cartouche.
- The tenth example is a 400 mm height limestone canopic jar inscribed for Maruta from the 18th Dynasty, reign of Pharaoh Thutmose III (1479-1425 BC) in display in the Metropolitan Museum and shown in Fig.10.^[23] The jar was inscribed using carved hieroglyphic scripts with blue paint for the scripts inside four bounded columns.



Fig. 9: Kohl jar of Hatshepsut from the 18th Dynasty.^[22]



Fig. 10: Canopic jar of Maruta from the 18th Dynasty.^[23]

- The eleventh example is perfume metal jar of Pharaoh Hatshepsut from the 18th Dynasty (1492-1477 BC) in display in the Agyptisches Museum, Univertat Bonne, Germany and shown in Fig.11.^[24] The metallic jar was inscribed by the Cartouche of the Pharaoh with hieroglyphic script inside it.
- The twelfth example is a 143 mm height alabaster ointment jar inscribed for Pharaoh Hatshepsut of the 18th Dynasty (1479-1458 BC) in display in the Metropolitan Museum and shown in Fig.12.^[25] The jar was inscribed using carved hieroglyphic scripts in two bounded columns while the lid was inscribed within three bounded rows.



Fig. 11: Perfume jar of Hatshepsut from the 18th Dynasty.^[24]



Fig. 12: Ointment jar of Hatshepsut from the 18th Dynasty.^[25]

- The thirteenth example is a faience funerary jar inscribed for Pharaoh Thutmose IV from the 18th Dynasty (1400-1390 BC) in display in the Museum of Fine Arts at Boston and shown in Fig.13.^[26] The inscriptions included two Cartouches for the Pharaoh and a hieroglyphic text above them besides a bounded column of a hieroglyphic text.
- The fourteenth example is a 326 mm height alabaster canopic jar inscribed for Tjuya, Mother of Queen Tiye and wife of Yuya from the 18th Dynasty, reign of Pharaoh Amenhotep III (2390-1353 BC) in display in the Metropolitan Museum and shown in Fig.14.^[27] The jar was inscribed using carved hieroglyphic scripts in two bounded columns while the lid was inscribed within three bounded rows.



Fig. 13: Funerary jar of Thutmose IV from the 18th Dynasty.^[26]



Fig. 14: Canopic jar of Tjuya from the 18th Dynasty.^[27]

- The fifteenth example is a kohl jar inscribed for Queen Tiye, the Great Royal Wife of Pharaoh Amenhotep III from the 18th Dynasty (1388-1350 BC) shown in Fig.15.^[28,29] The carved and blue colored inscriptions included three Cartouches for the Pharaoh and his wife and a hieroglyphic text above and below them using the hieroglyphic script.
- The sixteenth example is an alabaster perfume jar inscribed for Pharaoh Tutankhamun from the 18th Dynasty (1332-1323 BC) in display in the Egyptian Museum and shown in Fig.16.^[29] The jar was inscribed using carved and painted hieroglyphic scripts on the shoulder of the jar within a bounded rectangular area and on the neck in a bounded column.



Fig. 15: Kohl jar of Queen Tiye from the 18th Dynasty.^[28,29]



Fig. 16: Perfume jar of Tutankhamun from the 18th Dynasty.^[30]

- The seventeenth example is a 410 mm height and 180 mm maximum diameter alabaster canopic jar inscribed for Queen Mutnodjmet, the Great Royal Wife of Pharaoh Horemheb from the 18th Dynasty (1319-1292 BC) in display in the British Museum and shown in Fig.17.^[31] The carved inscriptions using the hieroglyphic script came in three bounded columns.
- The eighteenth example is a shabti jar from the 18th – 19th Dynasties (1295-1069 BC) shown in Fig.18.^[32] The jar was (probably) manufactured from pottery and it was inscribed using painted hieroglyphic scripts in black color within one bounded column on the jar body.



Fig. 17: Canopic jar of Queen Mutnodjmet from the 18th Dynasty.^[31]



Fig. 18: Shabti jar with lid from the 18th -19th Dynasties.^[32]

- The nineteenth example is a clay shabti jar from the 20th Dynasty (1186-1069 BC) shown in Fig.19.^[33] The jar was inscribed using the hieroglyphic script with text written within one column bounded by a red lines.
- The twentieth example is example is a 290 mm height and 218 mm maximum diameter alabaster canopic jar inscribed for Pharaoh Smendes founder of the 21st Dynasty (1077-1051 BC) in display in the Metropolitan Museum of Art at NY and shown in Fig.20.^[34] The jar was carved using hieroglyphic script with funerary text written in six columns bounded by a rectangular frame.



Fig. 19: Shabti jar from the 20th Dynasty.^[33]



Fig. 20: Canopic jar of Smendes from the 21st Dynasty.^[34]

- The twenty first example is a painted wooden jar of Padiuf, the Priest of Amun during the Third Intermediate Period (1069-664 BC) in display in the Louvre Museum and shown in Fig.21.^[35] The jar was inscribed using the hieroglyphic script with text written within four bounded columns using black ink.
- The twenty second example is an alabaster canopic jar inscribed for Pharaoh Psusennes I from the 21st Dynasty (1047-1001 BC) in display in the Egyptian Museum at Cairo and shown in Fig.22.^[36] The jar was carved using hieroglyphic script with funerary text written in four bounded columns.



Fig. 21: Canopic jar of Padiuf from the Third Intermediate Period.^[35]



Fig. 22: Canopic jar of Psusennes I from the 21st Dynasty.^[36]

- The twenty third example is painted wooden canopic jars from the 27th Dynasty (700 BC) in display in the British Museum at London and shown in Fig.23.^[37] Each jar was inscribed using the hieroglyphic script with text written within a bounded column using black ink. The side boundaries of each column were black thick lines.
- The twenty fourth example is a 255 mm height and 228 mm maximum diameter alabaster jar inscribed for Xerxes the Great from the 27th Dynasty (486-466 BC) in display in the Metropolitan Museum of Art at NY and shown in Fig.24.^[38] The jar was carved using hieroglyphic script with funerary text written in a single bounded column.
- The twenty fifth example is a 225 mm height and 130 mm maximum diameter alabaster jar inscribed in old Persian, Demotic and Hieroglyphic scripts for King Xerxes from the 27th Dynasty (486-465 BC) and belonging to Yale Babylonian Collection No. 2123 and shown in Fig.25.^[39] It was inscribed inside a bounded column using three ancient languages.



Fig. 23: Canopic jars from the 27th Dynasty.^[37]



Fig. 24: Jar of Xerxes from the 27th Dynasty.^[38]



Fig. 25: Jar of Xerxes from the 27th Dynasty.^[39]

Vases Inscriptions

The ancient Egyptians as the owner of one of the wonderful ancient civilizations manufactured vases from different materials and used them for indoor decoration and providing good smell. Not only this, but also they used the surface of such vases as writing media as will be illustrated by the following presentations:

- The first example is a vase inscribed for King Ka from the 0 Dynasty or Naqada III of ancient Egypt (3100 BC) and shown in Fig.26.^[40] A lot of data are missing from this artifact (material, dimensions and present location). The vase was inscribed by the Serekh of the King on the lower surface of the vase.
- The second example is a stone vase inscribed by the Serekh of King Djer from the 1st Dynasty (3050-3000 BC) in display in the National Archaeological Museum at France and shown in Fig.27.^[40] The inscription design is similar to that of King Ka except Djer name and symbol.



Fig. 26: Vase for King Ka from the 0 Dynasty.^[40]



Fig. 27: Vase for King Djer from the 1st Dynasty.^[40]

- The third example is an alabaster vase inscribed for King Semerkhet from the 1st Dynasty (2920 BC) in display in the National Archaeological Museum at France and shown in Fig.28.^[41] The vase was inscribed using a hieroglyphic script in one unbounded row followed by a simple Cartouche for the King surrounded by a text from both sides.
- The fourth example is a stone vase inscribed by the serekh of King Hotepsekhemwy from the 2nd Dynasty (2890-2865 BC) in display in National Archaeological Museum at France and shown in Fig.29.^[40] The inscriptions came within the serekh and below it.
- The fifth example is a stone vase inscribed by the serekh of King Seth-Peribsen from the 2nd Dynasty (2890-2686 BC) in display in the National Archaeological Museum at France and shown in Fig.30.^[40] The inscriptions came within the serekh and below it.
- The sixth example is a diorite vase inscribed by a serekh for King Nynetjer from the 2nd Dynasty (2850-2760 BC) in display in the Nubian Museum at Aswan and shown in Fig.31.^[42] It was inscribed within the serekh and beside it by two symbols.



Fig. 28: Vase of King Semerkhet from the 1st Dynasty.^[41]



Fig. 29: Vase of King Hotepsekhemwy from the 2nd Dynasty.^[40]



Fig. 30: Vase of King Seth-Peribsen from the 2nd Dynasty.^[40]



Fig. 31: Vase of King Nynetjer from the 2nd Dynasty.^[42]

- The seventh example is fragment of a siltstone vase inscribed for Kings Reneb (2884-2800 BC) and Nynetjer (2800 BC) from the 2nd Dynasty in display in the British Museum at London and shown in Fig.32.^[43] The fragment was inscribed using the hieroglyphic script.
- The eighth example is a vase inscribed for King Sekhemib from the 2nd Dynasty (2720 BC) in display in the National Archaeological Museum at France and shown in Fig.33.^[40] It was inscribed in four unbounded rows using the hieroglyphic script. The material and dimensions are not assigned.



Fig. 32: Vase fragment of Kings Raneb and Nynetjer from the 2nd Dynasty.^[43]



Fig. 33: Vase of King Sekhemib from the 2nd Dynasty.^[40]

- The ninth example is a fragment of a diorite vase inscribed for King Sekhemib from the 2nd Dynasty (2720 BC) in display in the Egyptian Museum at Cairo and shown in Fig.34.^[40] The fragment was inscribed using a nicely carved white hieroglyphic script in an unbounded area on the surface.
- The tenth example is a 160 mm height and 140 mm maximum diameter alabaster vase

inscribed for King Unas from the 5th Dynasty (2380-2350 BC) in display in the Louvre Museum at Paris and shown in Fig.35.^[44] It was carved on its body by hieroglyphic text surrounded by scenes.



Fig. 34: Vase fragment of King Sekhemib from the 2nd Dynasty.^[40]



Fig. 35: Vase of King Unas from the 5th Dynasty.^[44]

- The eleventh example is a 127 mm height alabaster vase inscribed for King Pepi I from the 6th Dynasty (2289-2255 BC) sold by Christies on 6th December 2007 at NY for 91,000 US\$ and shown in Fig.36.^[45] The inscriptions were carved on the surface including the Cartouche of the King without any internal or external boundaries.
- The twelfth example is a fragment of an alabaster vase inscribed for Pharaohs Thutmose I, Hatshepsut and Queen Ahmose from the 18th Dynasty (1500-1470 BC) in display in the British Museum at London and shown in Fig.37.^[46] The inscriptions were carved using the hieroglyphic script in three bounded columns. Each column included a Cartouche and a text above and below it.



Fig. 36: Vase of King Pepi I from the 6th Dynasty.^[45]



Fig. 37: Vase fragment from the 18th Dynasty.^[46]

- The thirteenth example is a faience vase inscribed for Pharaoh Amenhotep II from the 18th Dynasty (1427-1400 BC) in display in the British Museum and shown in Fig.38.^[47] The inscriptions were painted on the surface including the Cartouche of the Pharaoh using black ink with hieroglyphic text above and below the cartouches. The designer used two bounded columns for his text.
- The fourteenth example is a vase inscribed for Pharaoh Thutmose IV from the 18th Dynasty (1398-1388 BC) in display in the Brooklyn Museum at NY and shown in Fig.39.^[48] It was probably manufactured from faience and inscribed using black ink within one double bounded column using the hieroglyphic script.



Fig. 38: Vase of Amenhotep II from the 18th Dynasty.^[47]



Fig. 39: Vase of Thutmose IV from the 18th Dynasty.^[48]

- The fifteenth example is a 107 mm height and 88 mm maximum diameter alabaster vase inscribed for Queen Kiya, one of the wives of Pharaoh Akhenaten of the 18th Dynasty (1353-1323 BC) in display in the Metropolitan Museum of Art at NY and shown in Fig.40.^[49] The inscriptions were carved on the surface of the vase including the Queen's Cartouche using the hieroglyphic script with text arranged in a number of columns.
- The sixteenth example is a crystal vase inscribed for Pharaoh Rudamon from the 23rd Dynasty (757-754 BC) in display the Louvre Museum at Paris and shown in Fig.41.^[50] It was inscribed by two Cartouches of the Pharaoh with hieroglyphic text above and below them in two unbounded columns.

Vessels Inscriptions

The ancient Egyptians used vessels to store liquids and food stuff for present and future use. They used vessels as media for their writings to authorize their information and preserve them. Here, are some example depicting the use of vessels for text writing:

- The first example is a fragment of a vessel inscribed for King Ka from the 0 Dynasty or Naqada III (3100 BC) in display in the Metropolitan Museum of Art and shown in Fig.42.^[40] The vessel was inscribed by the Serekh of the King.
- The second example faience vessel fragment inscribed by a Serekh for King Aha from the 1st Dynasty (3100-3050 BC) in display in the British Museum and shown in Fig.43.^[40] The Serekh was drawn and inscribed using a black ink and a thick pen or brush.

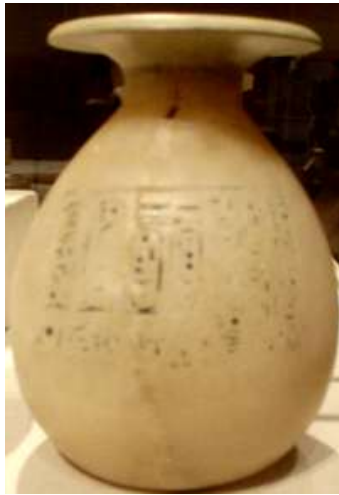


Fig. 40: Vase of Queen Kiya from the 18th Dynasty.^[49]



Fig. 41: Vase of Rudamon from the 23rd Dynasty.^[50]



Fig. 42: Vessel of King Ka from the 0 Dynasty.^[40]



Fig. 43: Vessel fragment of King Aha From the 1st Dynasty.^[40]

- The third example is a cylindrical vessel inscribed for King Hor Aha from the 1st Dynasty (3100-3050 BC) in display in the Kestner Museum at Hannover and shown in Fig.44.^[40] The vessel was inscribed by the Serekh of the King.
- The fourth example is a fragment of an alabaster vessel inscribed by a double name for King Sekhemib from the 2nd Dynasty (2720 BC) shown in Fig.45.^[40] It was inscribed by carving hieroglyphic text inside a rectangular boundary and painted using black ink.



Fig. 44: Vessel of King Aha from the 1st Dynasty.^[40]



Fig. 45: Vessel fragment of King Sekhemib From the 2nd Dynasty.^[40]

- The fifth example is an alabaster vessel inscribed for King Unas from the 5th Dynasty (2300 BC) in display in the National Museum at Warsaw and shown in Fig.46^[51]. The vessel was inscribed on its shoulder in one row of a carved and black-painted hieroglyphic script text.
- The sixth example is a 137 mm height and 120 mm maximum diameter alabaster vessel inscribed for King Pepi II from the 6th Dynasty (2289-2255 BC) in display in the Metropolitan Museum of Art and shown in Fig.47^[52]. It was inscribed by carving hieroglyphic text inside an external boundary and painting using black ink.



Fig. 46: Vessel of King Unas from the 5th Dynasty.^[51]



Fig. 47: Vessel of King Pepi II from the 6th Dynasty.^[52]

- The seventh example is a 173 mm height , 114 mm maximum diameter and 15 mm spout length alabaster brewer's vessel inscribed for the Queen Mother Ankhenes-Pepi from the 6th Dynasty, reign of King Pepi II (2246-2152 BC) in display in the Metropolitan Museum of Art and shown in Fig.48.^[53,54,55] The vessel was inscribed on its shoulder in one row of a carved and black-painted hieroglyphic script text bearing the name of the Queen Mother. The design of the vessel carried original mechanical design features that have to be taught to engineering students.

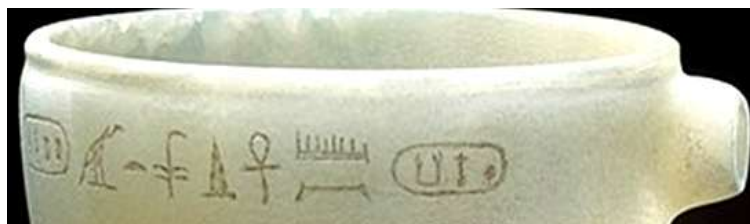


Fig. 48: Vessel of Ankhenes-Pepi from the 6th Dynasty.^[53,54,55]

Vessel Inscriptions

- The eighth example is a faience vessel inscribed for Pharaoh Amenhotep III from the 18th Dynasty (1388-1350 BC) in display in the Walters Art Museum at Baltimore and shown in Fig.49.^[56] It was inscribed by carving hieroglyphic text inside an external boundary including three Cartouches of the Pharaoh and text above and below them.

- The ninth example is a 573 mm height and 230 mm maximum diameter pottery vessel from the 20th Dynasty (1150-1069 BC) in display in the World Museum at Liverpool and shown in Fig.50.^[57] It was inscribed by a text written using the hieratic script in black in a line having 110 mm length.



Fig. 49: Vessel of Amenhotep III from the 18th Dynasty.^[56]



Fig. 50: Vessel from the 20th Dynasty.^[57]

Bottles Inscriptions

The ancient Egyptians used bottles to store liquids including perfumes. They used bottles as media for writing to present their inscriptions to those who can read their language. Here are some examples:

- The first example is an alabaster bottle inscribed by two Cartouches for Pharaoh Ramses II and Queen Nefertari from the 19th Dynasty , reign of Pharaoh Ramses II (1279-1213 BC) in display in the Petrie Museum at London and shown in Fig.51.^[58] The bottle has a spherical design and was inscribed by carving and black painting on its shoulder.
- The second example is a 128 mm height alabaster perfume bottle inscribed for Pharaoh Psamtek from the 26th Dynasty (664-610 BC) sold by Christies at London on 7 November 2001 for 2250 US\$ and shown in Fig.52.^[59] It was inscribed in a single column of a hieroglyphic script consisting of the Cartouche of the Pharaoh and few words above and below the Cartouche.



Fig. 51: Bottle of Ramses II from the 19th Dynasty.^[58]



Fig. 52: Bottle of Psamtek from the 26th Dynasty.^[59]



- The third example is a 210 mm height and 180 mm maximum diameter faience new year's bottle for Amenhotep from the 26th Dynasty (664-525 BC) in display in the Metropolitan Museum of Art and shown in Fig.53.^[60] It was inscribed in a vertical bounded area using carved hieroglyphic script besides some of the decorations around the bounded text-area.



Fig. 53: New year's bottle of Amenhotep from the 26th Dynasty.^[60]

Cups Inscriptions

The ancient Egyptians produced and used cups for purpose of drinking. They did not miss using the external surface of such cups as writing media as depicted by the following examples:

- The first example is a 35 mm height, 80 mm length and 40 mm width painted faience feeding cup from the 12th – 13th Dynasties (1850-1700 BC) in display in the Metropolitan

Museum of Art and shown in Fig.54.^[61] The cup was inscribed by a number of symbols painted by black ink on the cup surface.

- The second example is a 63.5 mm height and 41.4 mm diameter faience offering cup inscribed for Pharaoh Ramses III from the 20th Dynasty (1186-1155 BC) sold by Sands of Time and shown in Fig.55.^[62] The designer inscribed the cup through painting the cup surface in a two bounded columns text using the hieroglyphic script with the second column presenting the Cartouche of the Pharaoh.
- The third example is a 60 mm height faience cup inscribed for Pharaoh Osorkon II from the 22nd Dynasty (880-851 BC) in display for sale by CB-gallery for 5483 US\$ and shown in Fig.56.^[63] It was inscribed by two Cartouches for the Pharaoh painted in black beside each other.



Fig. 54: Feeding cup from the 12th-13th Dynasties.^[61]



Fig. 55: Offering cup of Ramses III from the 20th Dynasty.^[62]



Fig. 56: Cup of Osorkon II from the 22nd Dynasty.^[63]

Goblets and Chalice Inscriptions

Because they are great people in a wonderful and outstanding civilization, they designed different utensils for drinking of water and other liquids. How they used goblets and chalices as writing media will be investigated through the following examples:

- The first example is an alabaster goblet with golden rim and foot inscribed for Pharaoh Thutmose III from the 18th Dynasty (1479-1425 BC) in display in the Metropolitan Museum of Art and shown in Fig.57.^[64] The goblet was inscribed by the Cartouche of the Pharaoh with few hieroglyphic scripts above and below it.
- The second example is 140 mm height and 105 mm maximum diameter alabaster goblet inscribed for Pharaoh Akhenaten and his Queen Nefertiti from the 18th Dynasty (1353-1336 BC) in display in the Metropolitan Museum of Art and shown in Fig.58.^[65] The designer inscribed the goblet by carved two Cartouches in the right side for the Pharaoh and his wife and another two smaller Cartouches with hieroglyphic text above and below them all inside a rectangular frame.



Fig. 57: Goblet of Thutmose III from the 18th Dynasty.^[64]



Fig. 58: Goblet of Akhenaten and Nefertiti from the 18th Dynasty.^[65]

- The third example is 35 mm height and 25 mm width rim fragment of a faience chalice from the 22nd Dynasty (945-752 BC) in display in the Metropolitan Museum of Art and shown in Fig.59.^[66] The chalice rim was inscribed by casted (or carved) text using the hieroglyphic script.



Fig. 59: Chalice-rim fragment from the 22nd Dynasty.^[66]

Bowls Inscriptions

The ancient Egyptians used bowls as food vessels (solids and liquids) and used them as writing media as depicted by the following examples.

- The first example is stone bowl inscribed for King Khaba from the 3rd Dynasty by his Serekh (2670 BC) in display in the Petrie Museum and shown in Fig.60.^[67] The Serekh was carved on the outside surface of the bowl.
- The second example is a golden bowl inscribed for General Djehuty, was in service for Pharaoh Thutmose III from the 18th Dynasty (1479-1425 BC) in display in the Louvre Museum at Paris and shown in Fig.61.^[68] It was inscribed on the internal surface of the vertical rim using hieroglyphic script.



Fig. 60: Bowl of King Khaba from the 3rd Dynasty.^[67]



Fig. 61: Bowl of General Djehuty from the 18th Dynasty.^[68]

- The third example is a granite bowl fragment inscribed by the Cartouche of Pharaoh Akhenaten from the 18th Dynasty (1352-1336 BC) in display in the World Museum at Liverpool, UK and shown in Fig.62.^[69] The Cartouche of the Pharaoh was carved on the outside surface of the bowl without any coloring.
- The fourth example is a 310 mm height and 680 mm diameter granodiorite libation bowl inscribed for Mentuemhat from the 26th Dynasty (664-525 BC) in display in the British Museum and shown in Fig.63.^[70] It was inscribed on the outer surface of the bowl-rim.



Fig. 62: Bowl fragment of Akhenaten from the 26th Dynasty.^[69]



Fig. 63: Libation bowl of Mentuemhhat from 26th Dynasty.^[70]

- The fifth example is 85 mm height and 110 mm maximum diameter silver bowl from the 27th Dynasty (410 BC) in display in the Brooklyn Museum at NY and shown in Fig.53.^[71] The inscriptions are on the rim of the bowl and they were written using the demotic script.



Fig. 64: Silver bowl from the 27th Dynasty.^[71]

Dishes Inscriptions

The ancient Egyptians used dish to offer food and sometimes wine or beer. They didn't miss the use of dish-external surface as a writing media as will be depicted by the following examples:

- The first example is a stone libation dish inscribed for Ankh-ka, an official from the 1st Dynasty (3000 BC) in display in the Metropolitan Museum of Art and shown in Fig.54.^[72] The dish took the shape of the symbol 'Ankh' with main pool and three channels carved within the ankh elements. It was inscribed on the ankh side arms using the hieroglyphic script (not clear in the image of Fig.54).
- The second example is a 18 mm height and 80 mm maximum diameter painted faience dish inscribed for Pharaoh Thutmose II from the 18th Dynasty (1492-1473 BC) in display in the Metropolitan Museum of Art and shown in Fig.55.^[71] The dish was inscribed by the Cartouche of the Pharaoh using the hieroglyphic script.



Fig. 65: Dish of Ankh-ka from 1st Dynasties.^[72]



Fig. 66: Dish of Thutmose II from the 18th Dynasty.^[73]

- The third example is a 86 mm height, 181 mm length and 25 mm thickness glazed steatite tilapia fish-shaped dish inscribed for Pharaoh Thutmose III from the 18th Dynasty (1479-1425 BC) in display in the Metropolitan Museum of Art and shown in Fig.56.^[74] It was inscribed by the Cartouche of the Pharaoh just below the side fin.



Fig. 67: Fish shaped-Dish of Thutmose III from the 18th Dynasty.^[74]

Kohl Tubes Inscriptions

The ancient Egyptians used Kohl tubes to house Kohl used for eye protection and beauty enhancement. They didn't miss Kohl tubes as a writing media as investigated in the following examples:

- The first example is a 55 mm height and 45 mm maximum width faience kohl tube with golden rim and foot from the 18th Dynasty (1550-1295 BC) in display in the Metropolitan Museum of Art and shown in Fig.57.^[75] It was inscribed on its body using unclear ancient Egyptian language.
- The second example is a 65 mm height and 20 mm diameter faience Kohl tube inscribed for Pharaoh Thutmose IV from the 18th Dynasty (1400-1390 BC) in display in the Metropolitan Museum of Art and shown in Fig.58.^[76] The tube was inscribed by the Cartouche of the Pharaoh and a hieroglyphic text above and beside it.



Fig. 68: Kohl tube from the 18th Dynasty.^[75]



Fig. 69: Kohl tube of Thutmose IV from the 18th Dynasty.^[76]

- The third example is a 144 mm height and 18 mm diameter faience kohl tube inscribed for Pharaoh Amenhotep III and Princess Sitamun from the 18th Dynasty (1390-1352 BC) in display in the Metropolitan Museum of Art and shown in Fig.59.^[77] The tube was inscribed by the carved and black-painted Cartouche of the Pharaoh and a hieroglyphic text above and beside it.
- The fourth example is a 135 mm height and 22 mm diameter faience kohl tube inscribed for Pharaoh Amenhotep III and Queen Tiye from the 18th Dynasty (1390-1353 BC) in display in the Brooklyn Museum at NY and shown in Fig.60.^[78] The design of the tube inscriptions was similar to that in Fig.59 except the Cartouche of Queen Tiye and the color of the inscriptions.



Fig. 70: Kohl tube of Amenhotep III From the 18th Dynasty.^[77]



Fig. 71: Kohl tube of Amenhotep III from the 18th Dynasty.^[78]

- The fifth example is a 153 mm height and 20 mm diameter white glazed composition kohl tube inscribed for Pharaoh Tutankhamun and his Royal Great Wife Ankhesenamun from the 18th Dynasty (1332-1323 BC) in display in the British Museum and shown in Fig.61.^[79] The kohl tube was inscribed inside a single bounded column using the hieroglyphic script with two Cartouches for the Pharaoh and his wife.
- The sixth example is an 82 mm height and 19 mm diameter faience kohl tube inscribed for Pharaoh Horemheb from the 18th Dynasty (1319-1292 BC) in display in the World Museum at Liverpool and shown in Fig.62.^[80] It was inscribed by a hieroglyphic script with text above and below the Cartouche of the Pharaoh.



Fig. 72: Kohl tube of Tutankhamun from the 18th Dynasty.^[79]



Fig. 73: Kohl tube of Horemheb from the 18th Dynasty.^[80]

CONCLUSION

- This paper investigated the evolution of mechanical engineering in ancient Egypt through the inscription of utensils.
- The study covered a time span from Naqada III to the Late Periods.
- Inscribed jars from the 6th Dynasty, 12th Dynasty, 13th Dynasty, 18th Dynasty, 19th Dynasty, 21st Dynasty and 27th Dynasty were investigated.
- The hieroglyphic script was used in the inscription of most jars. The demotic and old Persian scripts were used in jars inscription during the 27th Dynasty.
- Jar-inscription took place through carving and/or painting.
- The ancient Egyptians inscribed jars manufactured from wood, pottery, terracotta, limestone, alabaster and obsidian.
- Inscribed vases from Naqada III (Dynasty 0), 1st Dynasty, 2nd Dynasty, 5th Dynasty, 6th Dynasty and 18th Dynasty were investigated.
- The hieroglyphic script was used in the inscription of the investigated vases.
- Vase-inscription took place through carving and/or painting.
- They inscribed vases manufactured from faience, siltstone, alabaster and an undefined stone.
- Inscribed bottles from the 19th Dynasty and 26th Dynasty were investigated.
- The hieroglyphic script was used in the inscription of the investigated bottles.
- Vase-inscription took place through carving.
- They inscribed bottles manufactured from faience and alabaster.
- Inscribed cups from the 12th -13th Dynasties, 20th Dynasty and 22nd Dynasty were investigated.
- The hieroglyphic script was used in the inscription of the investigated cups.
- Cup-inscription took place through painting.
- They inscribed bottles manufactured from faience and alabaster.
- Inscribed goblets and chalices from the 18th Dynasty and the 22nd Dynasty were investigated.
- The hieroglyphic script was used in the inscription of the investigated goblets and chalices.
- Goblets and chalices-inscription took place through carving and casting.
- They inscribed goblets and chalices manufactured from faience and alabaster.
- Inscribed bowls from the 3rd Dynasty, 18th Dynasty, 26th Dynasty and 27th Dynasty were investigated.

- The hieroglyphic script was used in the inscription of most of the investigated bowls while demotic script was used in the inscription of some of the 27th Dynasty bowls.
- Bowl-inscription took place through carving.
- They inscribed bowls manufactured from stone, granodiorite, silver and gold.
- Inscribed dishes from the 1st Dynasty and 18th Dynasty were investigated.
- The hieroglyphic script was used in the inscription of the investigated dishes
- Dish-inscription took place through carving and painting.
- They inscribed bowls manufactured from faience, stone and glazed steatite.
- Inscribed kohl tubes from the 18th Dynasty were investigated.
- The hieroglyphic script was used in the inscription of investigated kohl tubes
- Kohl tube-inscription took place through carving and painting.
- They inscribed bowls manufactured from faience, glazed composition and gold.

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