

# Mechanical Engineering in Ancient Egypt, Part XXXIII: Stone Statues Industry (Predynastic to Old Kingdom)

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## **Abstract**

*The objective of this paper is to investigate the development of mechanical engineering in ancient Egypt through the production of stone statues. This study covers the design and manufacturing of stone statues from the Predynastic Period (Naqada II) to the end of the Old Kingdom showing the type and characteristics of each statue. The decoration, inscriptions and beauty aspects of each statue were highlighted.*

**Keywords** –Mechanical engineering history, stone statues, Predynastic to Old Kingdom Periods.

## **I. INTRODUCTION**

Ancient Egyptians pioneered and mastered cutting and shaping stone for building their tombs, temples, pyramids and manufacturing products including different sized stone statues. The stone statues of the ancient Egyptians fill now almost all the National and International Museums around the World. Some of the National Museums in Europe called themselves 'The Egyptian Museum' such as the Egyptian Museum at Turin of Italy and the Egyptian Museum at Berlin. Such museums house a lot of stone statues of the ancient Egyptians.

Aldred (1950) wrote a book about the Middle Kingdom art in ancient Egypt. She presented the alabaster statue of Chancellor Mesehti from Late First Intermediate Period, limestone statue of Steward Merl from the 11<sup>th</sup> Dynasty, sandstone statue of King Menthu-Hetep from the 11<sup>th</sup> Dynasty, limestone statue of King Senusret I from Early 12<sup>th</sup> Dynasty, limestone head of King Mentuhetep II, red granite statue of King Amen-em-het I from Early 12<sup>th</sup> Dynasty, basalt turso of King Senusret I, block granite statue of Lady Sennuy from Early 12<sup>th</sup> Dynasty, dark grey granite statue of King Senusret I, dark granite statue of Steward of Lower Egypt Khti from Middle 12<sup>th</sup> Dynasty, black basalt statue of Ameny from Late 12<sup>th</sup> Dynasty, dark granite statue of Treasurer Hetep from Middle 12<sup>th</sup> Dynasty, limestone statue of Treasurer SI-Hator from Middle 12<sup>th</sup> Dynasty, black and grey granite statue of King Senusret II from Middle 12<sup>th</sup> Dynasty, red granite statue of King Sebek-hetep III from the 13<sup>th</sup> Dynasty,

black granite statue of Herald of Thebes Sebek-en-sau-ef from the 13<sup>th</sup> Dynasty and dark granite statue of Sebek-hetep VIII from 13<sup>th</sup> Dynasty [1].

Steindorff (1951) studied and analysed a royal head from ancient Egypt carved from diorite and belonged to the 6<sup>th</sup> Dynasty [2]. Smith (1960) Smith (1960) wrote a book about ancient Egypt as represented in the Museum of Fine Arts at Boston. Among his presentations a head of a Prince from the Old Kingdom and a head for his wife, a head for Treasurer Nofer from the 4<sup>th</sup> Dynasty, painted limestone bust of Prince Ankh-haf of the 4<sup>th</sup> Dynasty alabaster face of King Khafre from the 4<sup>th</sup> Dynasty, group statue of King Mankare and his Queen, alabaster statue of King Mankare, Statue of Khuner son of Mankare as a scribe and other statues from the 5<sup>th</sup> and 12<sup>th</sup> Dynasties [3]. Andelkovic and Fischer (1975) discussed the objects hold in the fist hands of male ancient Egyptians statues. He presented the case of Msi and Snnw pair statue and statue of Mmi-Sibw and his wife [4].

Roth (2002) in her study about servant statues in Old Kingdom serdabs presented some statues for a serving statue from Giza mastaba 2088, double serving statue for two women from the same mastaba and an inscribed serving statue from tomb of Nikauhathor and her husband at Giza [5]. Teeter (2003) wrote a book about treasures from the collection of the Oriental Institute of the University of Chicago. She presented selections from the Early Dynastic, Old Kingdom, First Intermediate Period, Middle Kingdom, New Kingdom, Third Intermediate Period, Late Period and Ptolemaic and Roman Periods. Among her presentations : a granite statue from 4<sup>th</sup>/5<sup>th</sup> Dynasties, statue for Nu-cau-inpu and his wife from the Old Kingdom, two statues for a male and female harpist from the Old Kingdom and Statue of Men-Khafet-Ka and his wife from the 5<sup>th</sup> Dynasty [6]. Bard (2007) wrote a book about the archaeology of ancient Egypt starting from the Predynastic Period up to Greco-Roman Period. Among her presentations was the statue of Rahotep and Nefert from the 4<sup>th</sup> Dynasty, statue of King Mankure and his Queen from the 4<sup>th</sup> Dynasty, limestone bust of Prince Ankh-haf from the 4<sup>th</sup> Dynasty and statue of King Mentuhetep

II from the 11<sup>th</sup> Dynasty [7]. Tassie (2008) in her Ph.D. study about social and ritual contextualisation of ancient Egypt hair and hairstyles presented a statue for Lady Meretites, the Overseer of the hairdressing and her son Khenu and the statue of Ty from the 5<sup>th</sup> Dynasty, statue of Redjit from the 2<sup>nd</sup> Dynasty, limestone head of a King from Early Dynastic, limestone statue of Nesa and Sepa from the 3<sup>rd</sup> Dynasty and statue of Netjerikhet in the step pyramid complex from the 3<sup>rd</sup> [8].

Lancie (2010) in a research article about ancient Egyptian religion and art presented a diorite statue for King Khafre and greywacke statue of King Menkaure and his Queen from the 4<sup>th</sup> Dynasty [9]. Brooklyn Museum (2011) in an article about Egyptian treasures from the Brooklyn Museum presented the limestone statue of the Granary Irukaph from the 5<sup>th</sup> Dynasty [10]. Flentye (2015) established the interrelationships between 4<sup>th</sup> Dynasty royal and non-royal statuary from the Giza Necropolis. The author discussed how royal statuary influenced the elite programs in the Western and Eastern cemeteries at Giza [11]. Wikipedia (2016) wrote an article about block statue emerged in the Middle Kingdom of ancient Egypt and continued to be produced up to the Late Period. As examples they presented block statues of official Senwosret from the 12<sup>th</sup> Dynasty [12].

## II. PREDYNASTIC PERIOD

The predynastic period is that before the First Dynasty of ancient Egypt, i.e. before 3100 BC [13]. There are two examples of stone statues during this period:

- The first example is a limestone figurine from Naqada II (3500-3200 BC) in display in the British Museum shown in Fig.1 [14]. Most probably this is a statue for a woman with cut hair as clear in the zoomed view in Fig.1.



**Fig.1 Limestone figurine from Naqada II [14].**

- The second example is a basalt statue from Naqada II (3250 BC) in display in the Ashmolean Museum at Oxford and shown in Fig.2 [15]. The statue has an overall height of 390 mm and is carved from basalt and shows the man standing. The statue shows the man standing, cutting his hair and wearing a veil of a triangular shape on his neck and down to his waist. The elements of the face are carved professionally even it is a hard rock, but Egyptians could carve it more than 5260 years ago.



**Fig.2 Statue of a man from Naqada II [15].**

- The third example is a limestone figurine for a seated woman from Late Naqada II (3450-3300 BC) in display in the Metropolitan Museum of Art at NY and shown in Fig.3 [16]. It has a 198 mm height and was decorated by woman hair and some paintings on her body. The proportions of the body are not logical and face elements were not professionally carved.



**Fig.3 Limestone statue from Late Naqada II [16].**

## III. EARLY DYNASTIC PERIOD

The Early Dynastic Period of ancient Egypt covers the 1<sup>st</sup> and 2<sup>nd</sup> Dynasties over a time span from 3100 to 2686 BC [17]. We have four examples of stone statues defining the development of stone statues in ancient Egypt during its first and second

Dynasties:

- The first example is a small lapis lazuli statue carved during the 1<sup>st</sup> Dynasty (2900 BC) and shown in Fig.4 [18]. There is a confusion about the gender of this statue. Is it a man or a woman ? .. The zoomed image in Fig.4 illustrates this confusion. The head says it is a man wearing a decorated cap, while the bust says it is for a woman. He/she is putting his/her right hand on the left hand on the chest as Muslims do in their prayer.



Fig.4 Lapis lazuli statue from the 1<sup>st</sup> Dynasty [18].

- The second example is a statue for King Khasekhemwy, the last King of the 2<sup>nd</sup> Dynasty (died 2686 BC) in display in the Ashmolean Museum at Oxford and shown in Fig.5 [19].

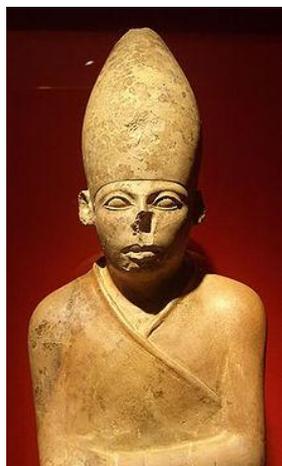


Fig.5 King Khasekhemwy statue from the 2<sup>nd</sup> Dynasty [19].

The King is wearing a cloak and the White Crown of Upper Egypt. This may be the first time for a King appearing with the White Crown.

- The third example from this period is a granite statue for Priest Redjit from the 2<sup>nd</sup> Dynasty in display in the Egyptian Museum at Cairo and shown in Fig.6 [20]. The designer showed the Priest putting his two palms on his knees. He is wearing a Khat

headdress, This may be the first time the ancient Egyptians used the hard rock granite to produced some of their statues.

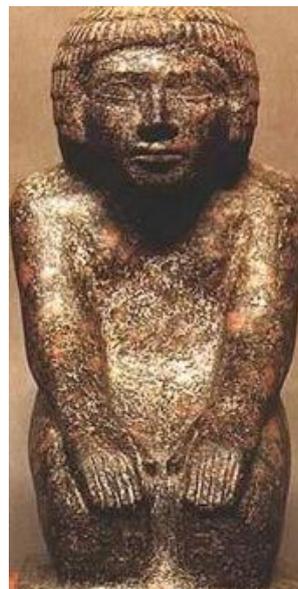


Fig.6 Granite statue of Redjit from 2<sup>nd</sup> Dynasty [20].

#### IV. OLD KINGDOM

The Old Kingdom of ancient Egypt covers from the 3<sup>rd</sup> Dynasty to the 6<sup>th</sup> Dynasty over the time span from 2686 to 2181 BC [21]. We have good examples of stone statues produced during this period detailed as follows:

##### 3<sup>rd</sup> Dynasty:

- Fig.7 shows a limestone statue for King Djoser, first King of the 3<sup>rd</sup> Dynasty (2670 BC) in display in the Egyptian Museum at Cairo[22]. The King is wearing a full-dress and a Nemes headdress. He is setting and putting his right hand on his chest and his left hand on his left leg. The carver showed the King with a thin long beard as clear in the zoomed image in Fig.7.

- The second example is from near the End of the 3<sup>rd</sup> Dynasty and the Early 4<sup>th</sup> Dynasty. It is a lime stone for Prince Rahotep and his wife Nofret in display in the Egyptian Museum at Cairo and shown in Fig.8 [23]. This is one the most wonderful stone statues generated in this early stage. The prince had a small hair, moustache and small beard. He is wearing a short white Schenti and a necklace. His wife Nofret was shown with her normal hair with a colored diadem on it, wearing a long Tunic and a colored pectoral. Both statues shows the details of the face in a very accurate manner as it is taken by a digital camera of nowadays.



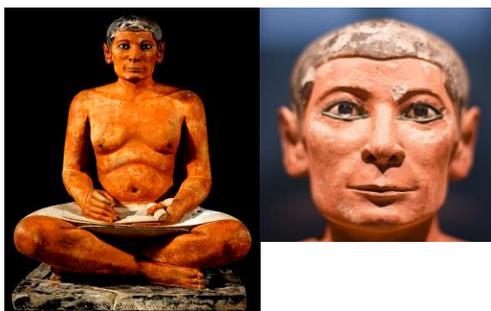
**Fig.7 Limestone statue of King Djoser [22].**



**Fig.8 Limestone statue of Rahotep & Nofret [23].**

**4<sup>th</sup> Dynasty:**

- The first example from the 4<sup>th</sup> Dynasty is a limestone statue for a seated scribe found in Saqqara of Egypt, in display in the Louvre Museum and shown in Fig.5 [24]. It shows the scribe wearing a short Schenti, putting his two hands on his legs in a position ready for writing. The zoomed image of the scribe shows him with his normal short hair and a serious facial pose.



**Fig.9 Limestone scribe statue from the 4<sup>th</sup> Dynasty [24].**

- The second example is a limestone group statue for Priest Neferherenptah (2589-2566 BC) and his family in display in the Egyptian Museum at Cairo and shown in Fig.10 [25]. The statue designer showed the Priest striding, his wife setting and his children setting. The priest and his sum are wearing a Khat headdress, short Schenti and a pectoral. His wife and daughter are wearing a long Tunic, and the wife is also wearing a pectoral. The limestone was painted by a number of colors including brown, yellow and black.



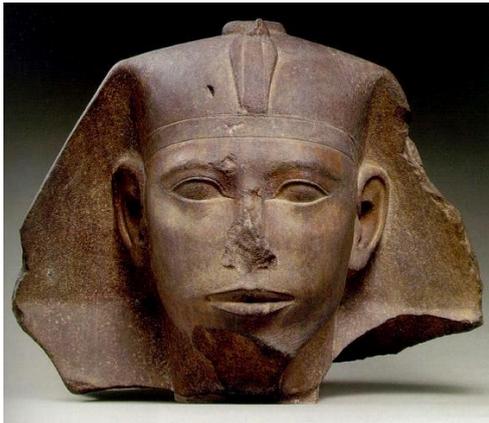
**Fig.10 Limestone statue of Neferherenptah from the 4<sup>th</sup> Dynasty [25].**

- The third example from the 4<sup>th</sup> Dynasty is a pair limestone statue for Memi and Sabu (2570-2465 BC) from the 4<sup>th</sup> Dynasty in display in the Metropolitan Museum of Art and shown in Fig.11 [26]. Memi is wearing a short Schenti and a Khat headdress while his wife Sabu is wearing a long Tunic and has a normal hair. The statue shows them in a sentimental position with her right hand holding his waist.



**Fig.11 Limestone statue of Memi and Sabu from the 4<sup>th</sup> Dynasty [26].**

- The fourth example is a red-quartzite head for King Djedefre, the 3<sup>rd</sup> King of the 4<sup>th</sup> Dynasty (2566-2558 BC) in display in the Louvre Museum and shown in Fig.12 [27]. The quartzite is a hard and tough stone [28]. Even though, the ancient Egyptians from more than 4560 years could carve it with the King face details shown in Fig.12 and even his Nemes headdress which has a complex shape and a lot of curved surfaces.



**Fig.12 Quartzite head of King Djedefre from the 4<sup>th</sup> Dynasty [27].**

- The fifth example is a diorite statue for King Khafre, the 4<sup>th</sup> King of the 4<sup>th</sup> Dynasty in display in the Egyptian Museum at Cairo and shown in Fig.13 [29]. The designer shows the King sitting on a chair wearing a short Schenti and a Nemes headdress and putting his hands on his legs. The statue overall height is 1.675 m. The ancient Egyptians could carve it from diorite even though diorite is an extremely hard stone and difficult to carve [30].



**Fig.13 Diorite statue of King Khafre from the 4<sup>th</sup> Dynasty [29].**

- The sixth example is a limestone statue for Prince Ankhhat, Vizier and Overseer of Works for King Khafre (2558-2532 BC) in display in the Museum of Fine Arts at Boston and shown in Fig.14 [31]. The Prince is shown necked with his hair cut. The limestone is painted to simulate the body of the Prince.



**Fig.15 Limestone statue of Prince Ankhhat from the 4<sup>th</sup> Dynasty [31].**

- The seventh example is a green-schist statue for King Mankare, the 6<sup>th</sup> King of the 4<sup>th</sup> Dynasty (2548-2532 BC) with Hator and Cyropolite in display in the Egyptian Museum at Cairo and shown in Fig.16 [32]. The King is wearing a short Schenti and the White Crown of Upper Egypt. Hator and Cyropolite are wearing a long Tunic and their crowns.



**Fig.16 Schist statue of King Mankare, Hator and Cyropolite from the 4<sup>th</sup> Dynasty [32].**

- The eighth example is an alabaster statue for King Menkaure, the 6<sup>th</sup> King of the 4<sup>th</sup> Dynasty (2532-2503 BC) in display in the Museum of Fine Art at Boston and shown in Fig.17 [33]. The overall height of the statue

is 2.53 m. The carver showed the King sitting, wearing a short Schenti, a Nemes headdress, his two hands are on his legs and holding an object in his right hand. The face shows the King as a serious man with thin long beard.



Fig.17 Alabaster statue of King Mankare from the 4<sup>th</sup> Dynasty [33].

- The last example from the 4<sup>th</sup> Dynasty is again for King Menkaure and his Queen. The statue is carved from the hard stone 'greywacke' in display in the Museum of Fine Arts and shown in Fig.18 [34]. It has an overall height of 1.3843 m. The statue shows the King wearing a short Schenti with front tail and belt, wearing the Nemes headdress and having a thin long beard. His wife is wearing a long Tunic, holding the King waist by her right hand and putting her left hand on his left hand in a very indicative sympathetic position.



Fig.18 Greywacke statue of King Mankare and his Queen from the 4<sup>th</sup> Dynasty [33].

#### 5<sup>th</sup> Dynasty:

- The first example of stone statues produced in the 4<sup>th</sup> Dynasty of ancient Egypt is for King Userkaf, the founder of the 5<sup>th</sup> Dynasty (2494-2487 BC) in display in the Egyptian Museum at Cairo and shown in Fig.19 [34]. It is carved from the hard stone greywacke and then polished. The King is wearing the modius crown.



Fig.19 Greywacke statue of King Userkaf from the 5<sup>th</sup> Dynasty [34].

- The second example is a limestone statue for a Scribe (2491-2345 BC) located in the Egyptian Museum at Cairo and shown in Fig.20 [35]. The statue shows the Scribe sitting and wearing a short Schenti, Khat headdress, pectoral and holding the writing paper on his legs. The statue was carved in a very professional way showing the details of the Scribe face and his headdress as if it was taken by a digital camera not carved. They were the ancient Egyptian artists.



Fig.20 Limestone statue of a Scribe from the 5<sup>th</sup> Dynasty [35].

- The third example is a Gneiss statue for King Sahure, the 2<sup>nd</sup> King of the 5<sup>th</sup> Dynasty in display in the Metropolitan Museum of Art and shown in Fig.21 [36]. The King is sitting, putting his hands on his legs, wearing a Schenti and holding an object in

his right hand. He has a thin long beard wearing a decorated Nemes headdress. Even though gneiss is one of the hardest stones, the Egyptian artist could carve it and produce the utmost quality and accuracy shown in Fig.21.



**Fig.21 Gneiss statue of King Sahure from the 5<sup>th</sup> Dynasty [36].**

- The fourth example is a limestone statue for a Musician from the 5<sup>th</sup> Dynasty (2477 BC) in display in the Museum of Fine Arts at Boston and shown in Fig.22 [37]. The carver showed them playing music and wearing a short Schenti and a small cap headdress. Their pose of the face depicts the emotion of the musician when playing music.



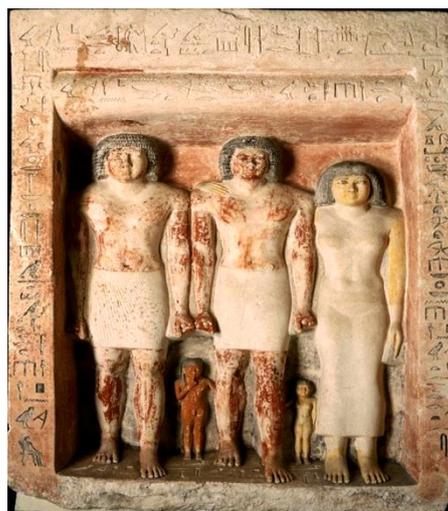
**Fig.22 Limestone statue of 2 Musicians from the 5<sup>th</sup> Dynasty [37].**

- The fifth example is a limestone pair statue of Ptahkhenuwy and his wife (2465-2323 BC) in display in the Museum of Fine Arts at Boston and shown in Fig.23 [38]. The statue shows Ptahkhenuwy and his wife standing in a very sympathetic position. He is wearing a short Schenti, Khat headdress and a pectoral. His wife is wearing a long Tunic, pectoral and bracelet.



**Fig.23 Limestone statue of Ptahkhenuwy and his wife from the 5<sup>th</sup> Dynasty [38].**

- The sixth example is a limestone group statue of Penmeru (2465-2323 BC) in display in the Museum of Fine Arts at Boston and shown in Fig.24 [39]. The statue shows Penmeru (in the middle) and in the right side wearing a short Schenti and a Khat headdress and (may be) holding an object in his hands. His wife is shown in a sympathetic position putting her right hand around her husband's waist and her left hand extended vertically. She is wearing a long Tunic with her normal hair. The statue shows their children (boy and girl) standing beside their legs. The frame in which the statues are located is inscribed inside a band-frame.



**Fig.24 Limestone group statue of Penmeru from the 5<sup>th</sup> Dynasty [39].**

- The seventh example is a limestone statue Nykara and his family from Late 5<sup>th</sup> Dynasty

(2455-2350 BC) in display in the Brooklyn Museum at NY and shown in Fig.25 [40]. The designer showed Nykara setting on a chair, his wife standing at his left and his daughter standing at his right side. He is wearing a short Schenti and a decorated Khat headdress. His wife is wearing a long Tunic and a decorated headdress as clear from the view of her head shown in Fig.25 [41]. His daughter is completely necked.



**Fig.25 Limestone statue of Nykara from Late 5<sup>th</sup> Dynasty [40].**

- The eighth example is a limestone pair statue of Nenkheftka and his wife (2350 BC) in display in the Walters Art Museum at Baltimore and shown in Fig.26 [42]. The carver showed Nenkheftka wearing a decorated Schenti with a belt and a decorated Khat headdress as cleared in the zoomed view in the same figure. His wife is wearing a long Tunic and a headdress as clear in her zoomed image. The overall height is 545 mm [43].



**Fig.26 Pair statue of Nenkheftka from Late 5<sup>th</sup> Dynasty [42].**

#### **6<sup>th</sup> Dynasty:**

- The first example is a limestone pair statue for Raherka (Inspector of Scribes) and his wife (2350 BC) very close to the beginning of the 6<sup>th</sup> Dynasty in display in the Louvre Museum and shown in Fig.27 [43]. The designer showed Raherks wearing a short decorated Schenti with belt, a Khat headdress and holding a cylindrical bar in each palm. His wife is wearing a long Tunic with her normal hair and in a very sympathetic position with her husband (holding his waist with her right and left hands and her body is almost 50 % behind his body).



**Fig.27 Raherka and his wife 2350 BC [43].**

- The second example is a granite statue for King Teti, the founder of the 6<sup>th</sup> Dynasty (2345-2333 BC) in display in the Egyptian Museum at Cairo and shown in Fig.28 [44]. The designer showed the King standing, wearing a short Schenti with belt and a front tail and the White Crown of Upper Egypt. He presented carefully the strong body of the King.
- The third example is an alabaster statue for King Pepi I, the 3<sup>rd</sup> King of the 6<sup>th</sup> Dynasty (2331-2287 BC) in display in the Brooklyn Museum and shown in Fig.29 [45]. The designer showed the King setting on a tall-back chair with Horus standing on the top edge of the chair. The King is putting his hands on his chest, holding two objects in his palms and wearing the White Crown of Upper Egypt.

- The fifth example is a kneeling statue from the reign of King Pepi II, the 5<sup>th</sup> King of the 6<sup>th</sup> Dynasty (2278-2184 BC) in display in the Metropolitan Museum of Art and shown in Fig.31 [47]. He is wearing a short Schenti and a Khat headdress and looking sharply to the future history of Egypt.



**Fig.28** Statue of King Teti from the 6<sup>th</sup> Dynasty [44].



**Fig.31** Kneeling statue from the 6<sup>th</sup> Dynasty [47].



**Fig.29** Statue of King Pepi I from the 6<sup>th</sup> Dynasty [45].

- The fourth example is a limestone head for Nekheby (2323-2150 BC) in display in the Museum of Fine Arts at Boston and shown in Fig.30 [46]. He is shown wearing a decorated Khat headdress and his face elements are well carved showing all the details even a light moustache.



**Fig.30** Limestone head of Nekhebu from the 6<sup>th</sup> Dynasty [46].

- The sixth example is a limestone statue for a servant grinding corn (2200 BC) in display in the Kunsthistorisches Museum at Vienna, Austria and shown in Fig.32 [48]. This one of the difficult statues to carve because of the too many details due to the position taken by the servant. However, because limestone is a soft stone it was easy for the ancient Egyptian carver to generate it with its too many details.
- The seventh example is limestone statue for Nefer-hekepes in display in the Pelizaeus Museum at Hildesheim, Germany and shown in Fig.33 [49]. The designer showed her wearing a white sleeveless Tunic with a long V-cut on her chest, a pectoral and a headdress as clear in the zoomed image in Fig.33..



**Fig.32** Statue of a servant from the 6<sup>th</sup> Dynasty [48].



Fig.33 Statue of Nefer-Hetepes from the 6<sup>th</sup> Dynasty [49]

- The eighth example is for Scribe Path-Shepse from the 6<sup>th</sup> Dynasty shown in Fig.34 [50]. He is taking the standard position of Scribes, wearing a short Schenti and a Khat headdress with serious pose as clear from his zoomed view. A lot of data are missing, definitely because its un-legal existence in some hands through artifacts robbery.



Fig.34 Statue of Path-Shepse from the 6<sup>th</sup> Dynasty [50]

## V. CONCLUSION

- This paper investigated the evolution of Mechanical engineering in ancient Egypt during the Predynastic to Old Kingdom periods through the design and production of stone statues.
- Ancient Egyptians produced limestone and basalt statues since the age of Naqada II.
- During the Early Dynastic Period the produced stone statues using lapis lazuli (1<sup>st</sup> Dynasty) and granite (2<sup>nd</sup> Dynasty).
- Stone statues for men with Cap and Khat headdress started to appear during the 1<sup>st</sup> Dynasty.
- Stone statues with White Crown of Upper Egypt started to appear from the 2<sup>nd</sup> Dynasty.
- Stone statues with the Nemes headdress started to appear from the 3<sup>rd</sup> Dynasty.
- Setting stone statues for Scribes started to appear in the 4<sup>th</sup> Dynasty.

- Pair and group stone statues started to appear in the End of the 3<sup>rd</sup> Dynasty.
- The ancient Egyptians succeeded to use stones with different levels of hardness:
  - They used low hardness stone such as alabaster.
  - They used medium hardness stones such as schist and limestone.
  - They used high hardness stones such as granite, diorite, greywacke and gneiss.
- They painted limestone producing colored statues simulating the human body.
- The stone statues of the ancient Egyptians showed their men wearing short Schentis , their woman wearing long Tunics and their children necked.
- Limestone statues with pectorals for men and women appeared starting from the 5<sup>th</sup> Dynasty..
- Stone statues for women wearing headdress appeared starting from the 5<sup>th</sup> Dynasty.
- State statues for musicians appeared in the 5<sup>th</sup> Dynasty and for beer makers appeared in the 6<sup>th</sup> Dynasty..
- Both setting and standing stone statues appeared in the Predynastic Period and continued through different periods.
- A stone statue with kneeling position appeared in the 6<sup>th</sup> Dynasty.
- Wonderful stone statues showing the amazing know-how of this industry using hard stones were a characteristic of the Egyptian Civilization during the Old Kingdom..

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