



Sustainable Solution for Sludge Drainage Problem





Project team

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Four students shared through their study of “Industrial water treatment”

Code no. EP328





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Agenda

Introduction

Primary goals

Project methodology

Result and conclusions

Recommendations



Introduction





Based on the state's direction in preserving the environment and sustainability approach in line with COP 27.

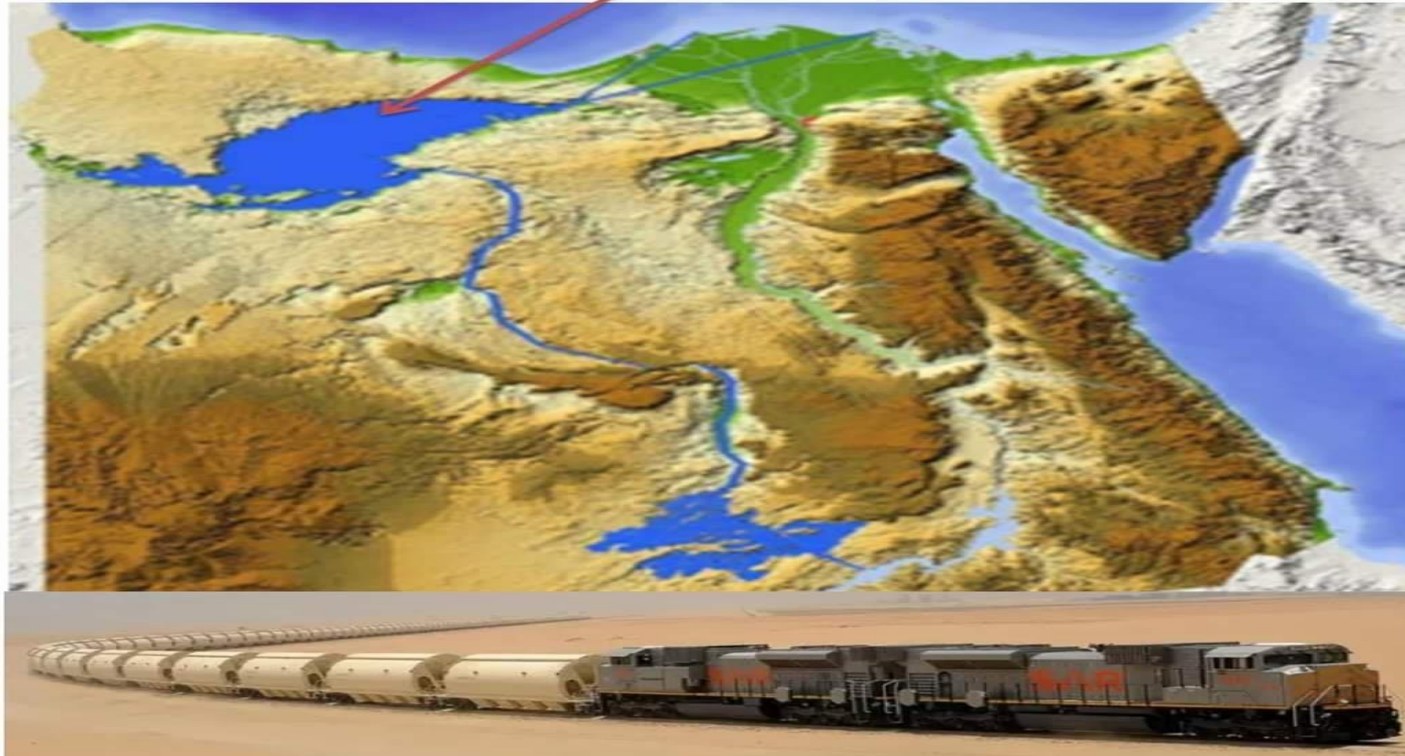
Project team idea summarized in how to serve and solve the problem of sludge which resulting from siltation., especially for the silt/sludge which comes out from water treatment process for potable and industrial water by reusing it in industrial applications aiming to protect environment, maximize the usefulness, and preserving the agricultural area.

Project idea has already supported and enhanced by the suggestion of running a siltation train to carry the silt of the High Dam and distribute it along its route, which starts from Lake Nasser and ends in the Qattara Depression.





منخفض القطارة





It is known that Egypt's share of water is about **55** billion m^3 /year of Nile river water.

Potable and industrial water consummation represent around **8** billion m^3 /year.

This amount passes through clarification and filtration processes in water treatment plants to remove organic and suspended solids pollutants from water which settles in the form of sludge.

The amount of sludge represents about **800,000** ton/year (30% solid concentration).

Most of this amount is discharged into surrounding environment causing pollution specially to water resources.



Drainage of sludge to water resources 800,000 ton/year





Primary goals





The primary goals of our project summarized in:

- Utilization sludge in industrial applications,
 - Preserving environment from the said source of pollution,
 - Value add and Stop wasting of these huge amount of sludge,
 - Stop dredging agricultural land,
- Finally,
- Reducing siltation at front of High Dam.





What are the motives for choosing this project?

Project team has choose the idea of this project based on achieving the integration between Pharos university and its community in Alexandria as well as the whole rest of Egypt through preserving and protecting environment and change threat to opportunity.





Project methodology





- Sludge samples are analyzed in different laboratories to compare the chemical composition of the sludge with the chemical composition of different industries.

Component	Sludge	Cement	Red brick	Pottery
Al₂O₃	18 %	3-8%	10-25%	14.8%
Fe₂O₃	0.8-3 %	0.5-6%	4-8%	-----
MgO	0.3 -0.6 %	0.1-4%	0-4%	-----
CaO	0.1 -1.6%	60-67%	1-15%	29.7%
Na₂O	0.6 -2.0 %	0.2-1.3%	Small percentage	1.3%
SO₂	0.1 -2 %	1-3% or not	-----	-----
SiO₂	49 %	17-25%	40-60%	36.3%

- ✓ Sludge analysis is very close to red brick specifications.





- Project team awareness and training visits were arranged to Ismael Deyab red brick factory in El-Amria in Alexandria.





- Shaping molds manufacturing .
- Utilization of shaping molds in manufacturing sludge bricks and burned in red brick factory and primitive ovens.
- Production and testing of sludge bricks through the following tests:

- Adsorption test.
- Compression test.
- Efflorescence test.
- Weighing test.





Many trials were done in different furnaces, different recipes and different temperatures, to produce sludge red bricks.

Finally,

project team got the optimum conditions to producing successfully sludge red bricks .





Sludge raw red bricks





Farm furnace temperature was about 250 °C



OPPO Reno6 5G
MegoArqoub



OPPO Reno6 5G
MegoArqoub





Traditional gas furnace temperature around 750 °C





Preparation of sludge red bricks for testing





Preparation of sludge red bricks for testing





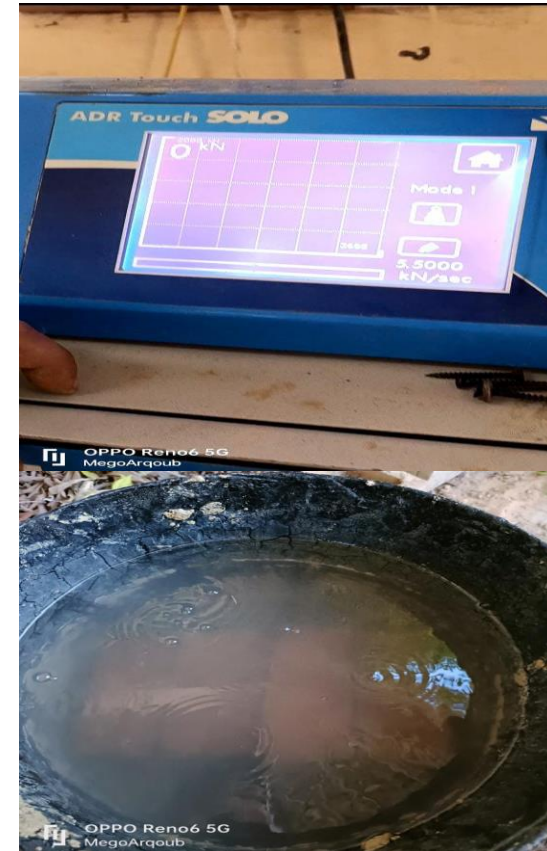
Test methods:

- Adsorption test
- Compression test
- Efflorescence test
- Weighing test

Tests had been performed in the following locations :

- SIDPEC lab.
- COMIBASAL lab.
- Ezz Steel
- Faculty of Engineering -Alex university

All tests above and laboratory results shown as follows:





Results

Water adsorption % = 19 %

Compression test = 2 N/ mm²

Efflorescence test = Nil

Weighing test = 895 gm





Analysis and Conclusions





Comparison between sludge red brick and red brick specifications

Parameter	Sludge red brick	Clay red brick
Water adsorption (%)	19	25
Compression (N/mm ²)	2	7
Ratio of Efflorescence (%)	Nil	Moderate
Weighing (gm)	895	1200





Despite the manufacturing process done manually and primitive compared to the advanced process running in red brick factories, the produced sludge bricks have more or less the same specifications of red bricks in terms of water adsorption, color and flowering,

On the other hand :sludge bricks produced are characterized by following advantage compared to red bricks :

- ✓ Less in weight
- ✓ Less in water adsorption
- ✓ Nil in Efflorescence
- ✓ Less in fuel consumption





Preliminary operating cost per 1000 unit

Parameter \ Type	sludge Red brick LE	Clay Red brick LE
Feedstock (1m ³)	50	150
Sand (0.25 m ³)	25	25
Fuel	96	160
Labor	100	100
Total	271	435





From the previous results the operating cost of sludge bricks represents **60%** of red bricks cost which in turns leads to cost saving equal to **40%** red bricks cost.





Conclusions

Sludge bricks are characterized by the following advantages.

- Eco-friendly to environment
- More economic
- Less Energy consumption
- Less gas emissions
- Reduce agricultural land dredging.





Recommendations





Firstly, This study is considered a prelude to subsequent projects to complete the required production systems and proposes the application in one of the existing factories where the advanced equipment for the manufacture of the process of compression and mechanical suction is available aiming to improve sludge brick quality.

Secondly, this project will be considered as a base of the strategic project of siltation train in Egypt when established.





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Thank you

