



A RESEARCH PAPER ON CONTRIBUTION OF SPRAY PLASTER TECHNOLOGY TO ACHIEVE THE PROJECT SPECIFICATION BY TIME

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Abstract: An important factor in improving the quality of work is the qualification of construction workers, who use new technologies. Without special training, workers cannot realize all the possibilities of modern materials and technology, and therefore will not be achieved economic effect. The process of mortar mechanical projection has been approved in terms of its performance, but industrial management knowledge should be applied to understand the economic viability of the system. The aim of this paper is to evaluate the productivity and logistics impact of the mechanized spraying process of rendering mortar on its global cost composition. On a worldwide scale, there are no studies that correlate logistics, productivity and costs for mortar rendering systems, indicating the originality of the research. A multiple case study was proposed. A comparison was made between the manual application and mechanical projection methods of internal wall plastering.

1- INTRODUCTION

Plastering is the term used to describe the material spread over the surface of irregular and coarse textured wall, column, and ceiling to provide a smooth, hard and leveled finish which can be painted for good appearance. In actual 'Plastering' is an art, truly recognized for constructing the base. It refers to the construction done with plaster which includes a layer of plaster on an interior wall or plaster decorative moldings done on ceilings or walls. The process of creating plasterwork is called 'Plastering'.

It's a unique skill to plaster the wall, level it and achieve a good and even finishing. Plasterboard is to form the sub-base for ceilings, partition walls. An adequate and rigid frame made up of timber battens is needed for it.

2- LITERATUREREVIEW

The literature review are searched from the authentic research papers and generals from online matter based on Integral University Lucknow. Initially some common keywords like plastering with machine etc was used for gaining the research papers on spray plaster. The selection criteria of paper is identify need of the topic or the purpose of this thesis.

1. **Gui Ponce de Leon et al (2011)** tells that Scheduling a project at the right level, at the right time, is an important consideration in project planning and scheduling. During management-level planning, when executive and senior management are involved, project-level schedules prevail. Schedules become detailed as the planning horizon switches from the whole of the project to project stages or phases; with assumptions tested and information firmed-up, management can engage in detailed planning.
2. **J. Kurz et al (2012)** his paper tells us about the plaster which is done in a commercial and residential building . He used the technology of mobile plastering robot at construction site which is operate by skilled operator. The machine do the plaster in a less time .
3. **Dr. Shiv K Sahu et al (2013)** states that the concept of text mining is nothing but the mechanism of extracting non-trivial and interesting data from the unstructured text dataset. Text mining is consisting of many computer science disciplines with highly oriented towards the artificial intelligence in general such as the applications like information retrieval, pattern recognition, machine learning, natural language processing, and neural networks. The main difference between the search and text mining is that, search needs users attentions means based users requirement search action will perform whereas text mining is the internal process which attempts to find out information in the pattern which is not known before.
4. **Mr. Dhiren K. Paghdar et al (2013)** states that Drywall (also known as Plasterboard, Wallboard, Gypsum board, Or Gyprock) is a panel made of gypsum plaster pressed between two thick sheets of paper. It is used to make interior walls and ceilings.
5. **Dionysios I. Kolaitisa et al (2013)** tells that Phase Change Materials (PCM) can be used for thermal energy storage, aiming to enhance building energy efficiency. Recently, gypsum plasterboards with incorporated paraffin-based PCM blends have become commercially available. In the high temperature environment developed during a fire, the paraffins, which exhibit relatively low boiling points, may evaporate and, escaping through the gypsum plasterboard's porous structure, emerge to the fire region, where they may ignite

6. **Julkaisija et al (2013)** tells that the construction industry continues to be very conservative compared to manufacturing industry. In many cases when the new automatic products are not complementary to the old ones, they are scarcely implemented, and their use is kept to minimum. Moreover, if these products introduce inconveniences to the whole construction cycle, they are openly rejected. On the contrary, in the manufacturing industry the people and the environment respond very positively to technological innovation.
7. **Alexander Braun et al (2014)** states that on-site progress monitoring is essential for keeping track of the ongoing work on construction sites. Currently, this task is a manual, time-consuming activity. The research presented here, describes a concept for an automated comparison of the actual state of construction with the planned state for the early detection of deviations in the construction process.
8. **Okmen et al (2014)** states that The Critical Path Method (CPM), which is used to schedule construction activities that depend on one another through network relationships, is deterministic with regard to the duration assigned to the execution of the activities and the results produced in certain values. Unfortunately, construction activities are performed under uncertain conditions. Project risks cause variations in activity duration, and in turn the entire network is affected uncertainty.
9. **Akash S. Tambi et al (2014)** tells that the construction industry is labour intensive and construction work is conducted in risky and dangerous situations. The importance of construction automation has grown rapidly in developed countries. In developing countries like India, the construction industries need automation technologies such as new machineries, electronic devices etc. The infrastructure project requires more numbers of skilled labour, good quality of work, increases productivity etc. The problems associated with construction work such as decreasing quality of work, labour shortages, and safety of labour and working condition of projects.
10. **Daria Petrosova et al (2014)** study based on the risk management he tries to say that construction refers to a number of industrial processes with highly increased risk. There must be big amount of accidents occurs in doing the plaster work manually with large wooden shuttering . He wants to say that through spray plaster he can reduce the accidents.
11. **Olivier Buzzi et al (2014)** experimented the two methods to measure the bulk volume of soil specimen which are having irregular shapes. The methods are the wax method and the plastic bag method.He tells us about the new coating of hand spray plaster.
12. **Mahesha P.K. et al (2014)** he tells that in an economic sector , the business of building construction plays an important role . He tells that the building construction is divided into two groups commercial infrastructure and residential building . For doing manually plaster in both types of building contains a large amount of labour cost. So with the help of spray plaster we can reduce the cost of plastering.

13. Nikolay Ivanovich et al (2014) in his study we are able to know about the mechanized technology of application of dry building mixes is a separate highly qualified branch in a field of finishing work. Application of dry mixtures is one of the most important factor in improving the quality of finishing works.

14. Olga Gamayunova et al (2015) refers that spray plaster technique can be applied mostly in large structures .Without special training workers cannot realized all the possibilities of modern materials and technology and therefore will not be achieved economic effect.

3- DISCUSSIONS

The spray plaster is a technology to provide a level and smooth surface ready for further decoration .Spray plaster can be applied as a self finished white texture requiring no further decorating. Spray plaster is one of the technology used for the protective and decorative coating of walls and for moulding of decorative elements. The benefit of spray plaster is to ensure the consistent uniform finish. The spray plaster technique can be applied mostly in large structures without special training workers can not be realised all the possibilities of model materials and technology & therefore will not be achieved economic effect.

4- METHODOLOGY

Based on Literature Review following methodology has been formed

1. Identification of various time component for manual plastering.
2. Identification of various time component for machine plastering.
3. Comparison of different time parameter for different plastering situation by collecting data in various sites.
4. Synthesis of selection criteria based on cost result.
5. Interviewing to the various P.M / A.P.M / Site Engineer of various construction site.

5- DATA COLLECTION

Name of site: Veeta Day Factory UPSIDC Barabanki U.P

Plastering in Staff Quarter Residential Building.

Plastering in Staff Quarter Residential Building Data Collection

Staff Quarter Multi storey Residential Building (G+4) Building contains :

- Ground floor
- First floor

- Second floor
- Third floor
- Fourth floor

6- CALCULATION

Total Area of Plot = $130 \times 19 = 2470$ Sq. ft

Total Plastering area of Ground floor

Rough surface = $[130+130+19+19] \times 10 = 2980$ sq. ft.

Total No. of Windows = 12

Size of One window = $(6 \times 5') = 30$ sqft

Total No. of window size = $30 \times 12 = 360$ sq.ft.

No. of doors = 2 (Main gate)

Size of 1 door = $12 \times 19 = 108$ sq.ft.

Total size of both doors = $108 \times 2 = 216$ sq.ft.

Total Deduction = Total area of doors + Total area of windows

= $360 + 216$

= 576 sq.ft.

Total rough plastering area (outside) = Total Area - Total Deduction = $2980 - 576 = 2404$ sq.ft.

Thickness of Plaster at outside = 12 mm

Now, we have to calculate the inner plastering area :

We have to give the description of whole floor

Total No. of Units :

No. of Rooms = 6

Size of One Room = 10×8

Plastering area of Room = $(10+8+10+8) \times 10$

Height of Plastering = 10'

Plastering area = 360 sq.ft.

Total No. of Rooms = 6

Total area of 6 Rooms = $6 \times 360 = 2160$ sq.ft.

No. of halls = 4

Size of Hall's = $16' \times 15'$

Area of Plastering of hall one

= $16+15+16+15 = 62$ ft.

Height of Plastering = 10 ft

Total Area of Plastering of hall are = $62 \times 10 = 620$ sq. ft.

Size of Hall two = $15' \times 9'$

Area of Plastering with height 10'

= $(15+15+9+9) \times 10' = 480$ sq.ft.



3. Size of Hall three = 19'×28'

Area of Plastering = $(28+28+19+19) \times 10$
= 940 sq.ft.

4. Size of Hall four = 15'×18'

Area of Plastering = $(15+15+18+18) \times 10$
= $66 \times 10 = 660$ sq.ft.

No. of toilets at Ground floor = 5

Size of 1 toilet = 3.6'×4'

Area of Plastering of 1 toilet = $4+4+3.6+3.6 = 152$ sq.ft.

Total No. of toilets =5

Total Area of 5 toilets Plastering = $5 \times 152 = 760$ sq.ft.

No. of attached toilet bathrooms = 2

Size of one attached toilet bathrooms = 10'×7'

Plastering area of one toilet = $[10+10+7+7] \times 10 = 340$ sq.ft.

Total area of both attached toilet bathroom = $340 \times 2 = 680$ sq.ft.

Model NO.	N2 MPS55
Cost-	US DOLLAR 16000
IN INR	1136000
Vibrating Amplitude	Trailer Concrete Pump with Electric or Diesel Power
Certification	ISO9001: 2000, CE, BV
Condition	New
Color	Yellow
Container	1*20'gp
Rubber Hose	16m
Main Oil Pumps	German Hawe, Rexroth Series and Japanese Kawasaki
Lubricating System	Fully Automatic Multi-Points Lubricating
After-Sales Service Provided	Engineers Available to Service Machinery Overseas
Brand	Saintyol Dawin Machinery
Key Word	Mortar Spraying Machine
Power	Electric, Diesel, or Generator
Trademark	Saintyol DAWIN
Transport Package	Standard Exporting Package
Specification	CE, ISO
Origin	Qingdao Shandong
HS Code	84134000

Operation

Keeping the air pump running for 2-5 minutes after turn on the machine (heating up the grease lubrication to make the air pump work normally), then add the mixture of water and cement into the hopper (to lubricate the hose), then add the normal material to start working.

When finishing the work, the machine should be cleaned. Clean the material in the hopper with water out of the hose, until the clean water flow out. Then dismantle the hose, at last hang the hose vertically, clean the sand in the inner surface of the hose with clean water.

Materials

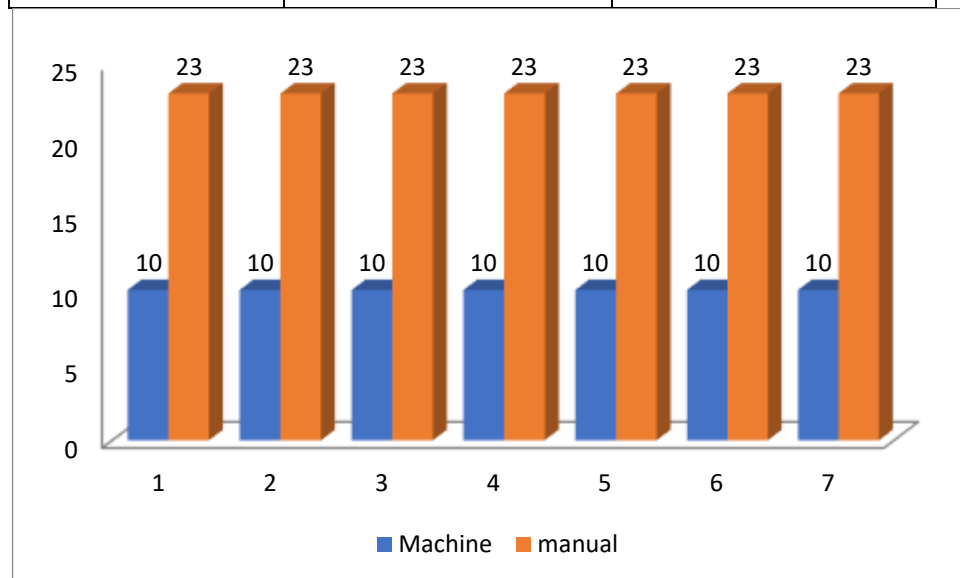
Normal mortars, insulation mortars, dry mortars, anti-crack mortar, interface agents, construction glues, bonding agents, anti-fire materials, epoxy coating, etc.



Comparison of Time

Area (in sq.ft.)	TIME (IN DAYS)	
	MACHINE	MANUAL
9305	10	23
9305	10	23
9305	10	23
9305	10	23
9305	10	23
9305	10	23

9305	10	23
65135	70	162



Recommendation

CATEGORIES	MANUAL	MACHINE
1. Edge & Core	YES	NO
2. Cofferdam	YES	NO
3. Plain plastering	NO	YES
4. Edge & Core in Beam & Column	YES	NO
5. Edge & Core in Window	YES	NO
6. Door	NO	NO
7. Sutter	NO	NO
8. OUTERWALL Rough Plastering	NO	YES
9. Ceiling Plastering	YES	NO
10. PARAFET Plastering	YES	NO

7- CONCLUSIONS

- If we are going to buy a spray plaster machine of Model No. N2MPS55 whose cost in market is Rs.11,36,000. Then, we will obtained such observation,
- When we start plaster with this machine then we can take a data of our site STAFF QUARTER OF VEETADAY FACTORY.
- For doing plaster of 9305 sqft, we will take 10 days for completion of plaster .
- So for doing plaster of 6051 m². it will take 70 days for completion of plaster till 6th floor .

- And in manually plastering , we will do the plaster of area 9305 sqft in 23 days.
- For plastering till 6th floor , we will do or finished plastering in 162 days .
- It shows that machine plaster takes less time in comparison with manual plaster.
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- Then we have to add the area from ground floor to sixth floor:
- Such calculation will occur,
- $9305 + 9305 + 9305 + 9305 + 9305 + 9305 + 9305 = 65135 \text{ sq.ft.}$
- Or, 6051 m^2 .
- When we will do a plaster 6051 m^2 with this machine. Then we will achieve the cost of machine.
- When we will do the plaster after 6th floor then we will reach the profit of this machine in cost.
- Mechanized plastering does have limitation where in method phases challenges.

8- REFERENCES

- 1- Applied Mechanics and Materials Vols. 635-637 (2014) pp 2085-2089 Submitted: 21.07.2014 © (2014) Trans Tech Publications, Switzerland.
- 2- International Journal of Architectural Heritage Conservation, Analysis, and Restoration. Journal homepage: <http://www.tandfonline.com/loi/uarc>.
- 3- Liu, Xianfeng and Buzzi, Olivier, "Use of Hand-Spray Plaster as a Coating for Soil Bulk Volume Measurement," Geotechnical Testing Journal, Vol. 37, No. 3, 2014, pp.1-7, doi:10.1520/GTJ20130091.ISSN 0149-6115
- 4- DESIGN OF AUTOMATIC WALL PLASTERING MACHINE Ankush N. Askar, Laukik P. Raut Student, M. Tech CAD/CAM, GHRCE Nagpur, India Department of Mechanical Engineering, GHRCE Nagpur, India
- 5- Mr Bhandari Shubham J.1, Mr Chavan Nilesh V.2, Mr Bhoite Mayur R.3, Mr Deshmane Nitin P.4 Mr Kulkarni Y. S.5 1,2,3,4 Student Mechanical Department, SNJB KBJMCOE Chandwad, Maharashtra, India 5 Assistant Professor Mechanical Department, SNJB KBJ COE, Chandwad, Maharashtra, India .
- 6- IOSR Journal of Mechanical and Civil Engineering (IOSR-JMCE) e-ISSN: 2278-1684, p-ISSN: 2320-334X, Volume 11, Issue 4 Ver. I (Jul- Aug. 2014), PP 01-06 www.iosrjournals.org

- 7- Automatic Wall Plastering Machine ArunkumarBiradar, VaibhavShejwal, AkshayBarate, Sameer Barate
- 8- Electrical Motion Systems Division Hanns-Klemm-Strasse 28, D-71034 Boeblingen, Germany E-mail: mdalacker.germany@moog.com.
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