An Overview: Automation & Robotics Used in a Construction Industry

Mr. S. S. Kumbhar[1], Mr. K. S. Pawar[2], Mr. N. P. Bansode[3], Mr. S. M. Jadhav[4], Mr. A. B. Chavan[5], Prof. Dipak P. Patil[6]*

[1,2,3,4,5] UG Student, JSPM's Imperial College of Engineering and Research, Wagholi, Pune

[6] Assistant Professor, JSPM's Imperial College of Engineering and Research, Wagholi, Pune

Abstract – In last few years many prototype robots have been developed for the construction industry, but only few examples are being found in the industry of construction today. Several contractors in the construction industry are doing R&D program to introduce robotics in construction industry.

In India, the development of construction industryis one of the biggest parts. The development of construction industry plays an important role to improve the general national economy of the India, the grumblings of poor development quality is real issue in the India development industry. For effective quality work, for example, absence of talented specialists, ineffectively introduced hardware, poor plant, and so on among this in an expansion in the genuine cost of development and work.

The development of construction business is work concentrated and development work is led in perilous circumstances. The significance of development, mechanization has developed quickly in created nations. In creating nations like India, the development businesses require robotization advancements, for example, new apparatuses, electronic gadgets and so forth. This paper assesses development robotization and mechanical autonomy innovation with regards to its capacity to fulfill the regularly clashing requests of directors and proprietors, specialists, and society in development world. Contrasts in social, financial, and business hones help clarify why development computerization and mechanical autonomy equipment is creating so much action and interest in development of construction world, while specialists is likewise concentrating on programming.

Keywords- Automation, Automation at Site Level, Robotics, Robotics in Construction.

----------X----------

1. INTRODUCTION

Until as of late, the construction business was a standout amongst the newest to examine and improvement fields for the mechanical technology and computerization group, in spite of the way that this industry is one of the most seasoned and speaks to the biggest monetary divisions. Today the Indian populace is getting instructed, consequently work concentrated occupations have not very many takers and the pattern will exacerbate with the dissimilarity in the salary diminishing with the future age picking advanced education. By the by, some of nowaday's development forms have changed nearly nothing. The days of yore pulleys are substituted by cranes. Now and again development work is led under risky condition and circumstance, in this manner there is requirement for mechanical autonomy to streamline gear activity enhance wellbeing and nature of work Automation should be possible in uniform block laying, putting of uniform thickness of roofs, inside and outside dividers.

Automation can have diminished work trustworthiness higher yield and expanded efficiency, less fluctuation, decreased human blunders, more prominent control and consistency, safe workplace, adaptability and so on. Development stage is one of the vital parts of structural designing structures.

The achievement of a venture relies upon how well the development eliminate is conveyed. Effective and prudent development is especially imperative in light of the expanding intricacy of structures being assembled, the accessibility of enhanced materials and development hardware. Ordinarily in assembling field, robots are stationary and item moves along the mechanical production system.

The use or the introduction of automatic equipment's or other process or facilities in construction is called as Automation in construction Industry. Basic activities in building construction, and civil engineering projects developed by robots are positioning, connecting, attaching, finishing, coating, concreting, building, inlaying,jointing, scaffolding, demolishing, tunneling, inspecting, and repairing elements. Efficient and economical construction is particularly important because of the increasing complexity of structures being built, the availability of improved materials and construction equipment. Typically, in manufacturing field, robots are stationary and product moves along the assembly line.

2. LITERATURE STUDY

[2.1] Survey on automation of the building construction & building products industry, Pentti vaha, Tapio Heikkila, Pekka Kilpelainen, Markku Jarviluoma & Rauno Heikkila. 2013

A commonly held view is that the construction industry is labour- intensive, project based, and slow to adopt emerging technologies compared to other "project shop" manufacturing industries [Product-Process Matrix]. A construction site can be regarded as a "project shop", since tools and manufacturing equipment are brought on-site, whereas component prefabrication is a conventional shop, line or cell-structured. There have not been any dramatic changes in construction methods in the last 40 years, although some methods have been developing. The construction Industry is also considered to be a conservative innovator and late adopter of new technology. Therefore, construction is often considered a somewhat old-fashioned industry. However, in the design phase, methods such as Computer Aided Design (CAD) and Finite Element Method (FEM) are commonly adopted. Also Building Information Model (BIM) is increasingly applied in the design and engineering phase.

[2.2] Application of Robotics in Mining Industry: A Critical Review Santosh Kumar Nanda* Ashok Kumar Dash Sandigdha Acharya* Abikshyana Moharana* Year 2010**

The advance of artificial intelligence and therefore the increase in automaton use have raised the necessity for theoretical account of robots, among the aims of that square measure the look of recent robots, task coming up with of existing robots, performance analysis and cycle time estimation. For mining surroundings, each the open cut and underground mining desires seriously application of artificial intelligence. In deep mining, the space and pillar or board and pillar technique progresses on the seam, whereas pillars and timber square measure left standing to support the mine roof and extremely equipped machineries wont to maintain safety and reduced the human action, it's a great deal essential to adopt robotic technology in underground mines. it's established that, robots are going to be doing jobs like giving birth explosives, going underground once blasting to stabilize a mine roof or mining in areas wherever it's not possible for humans to figure or perhaps survive.

[2.3] Automation in construction industry, Divyesh Joshi1, Rushabh Shah2 M.E. Student, Civil Eng. Dept., SNPIT &RC, Umrakh (GTU), Bardoli, Gujarat, India1 Asst. Professor, Civil Eng. Dept., SNPIT &RC, Umrakh (GTU), Bardoli, Gujarat, India 2009

In India, the construction industry is one of the largest industrial sectors. The construction industry plays to enhance the overall national economy of the India; the complaints of poor construction quality is major problem in the India construction industry. For successful quality work, such as lack of skilled workers, poorly installed equipment, poor plants, etc. among this in an increase in the real cost of construction & labour. 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. Studying recent application and projects for using robots and automation in the construction industry. The qualitative study has been carried out. From this qualitative study some obstacles in implementing automation are discussed in this paper.

[2.4] Automation and robotics in construction: International research and achievements Edmundas Kazimieras Zavadskas December 2009

This paper describes an advanced scheduling methodology that is part of a research program devoted to the topic of Location Based Repetitive Scheduling Method for housing projects in India. Now a day there is a cut throat competition in all fields of Engineering and construction in India. To gain the success in the field of construction in these evolving times, project managers must emphasize efficiency in all aspects of their operations, including resource flow process, mainly the labor crew performance. Most often project manager has to plan location based repetitive projects.

[2.5] AUTOMATION & ROBOTICS FOR ROAD CONSTRUCTION & MAINTENANCE By Miroslaw Skibniewski[1] and Chris Hendrickson,[2] Members, ASCE(Reviewed by the Urban Transportation Division

With rising street development and support costs and the absence of efficiency change, mechanized street development and upkeep prepare meant will give an appealing contrasting option to the execution of routine work errands later on. This paper surveys the run of the mill assignments pertinent to this space, and also existing and future mechanized gear for errand execution. The qualification between numerically controlled (NC) machines and self-ruling hardware is dis-cussed in view of assignment prerequisites and machine capacities. Center advances for robotized hardware are surveyed. Cases of existing numerically controlled gear are displayed. Monetary attainability issues and work wellbeing parts of mechanized street development and support hardware are sketched out. The paper infers that street development and support assignments have a critical potential for continuous mechanization because of the dullness and generally direct tangible prerequisites of numerous undertakings. At last, incorporated, multitask frameworks ought to be possible once single-reason computerized gear demonstrates fruitful.

3. THEOROTICAL CONTENT

AIM: To study the importance of automation in construction industry to reduce cost of the project, to reduce labour shortage & to ensure timely completion of project.

4. OBJECTIVES:

1. To minimize cost of project
2. To control the labour shortage
3. To improve the quality of work
4. To improve speed of construction
5. Timely completion of project

5. COMPARISON MANUAL VS AUTOMATED:

1. BATCHING PLANT

Sr. No.	Factors	Manually	Automated
1.	Equipment	One Bag Mixer.	Batching Plant.
2.	Capacity	4.5cu.m/hour.	24cu.m/hour.
3.	Labours Required	6-7 labours are required.	Only one skilled labour is required.
4.	Cost	Overhead+ fixed cost of labours.	Payment for only one skilled labour.
5.	Time	If want to do of 100 cu.m it wiil take 20-25 hours.	Here it is produce within 5 hours.
6.	Quality	Average quality.	100 % quality assurance.
7.	Transport	Transport manually.	It can be transport by transit/vertical mixer.
8.	Wastage Of Material	15-20% wastage.	0-1% wastage.
9.	Completion	No timely completion.	Timely completion.

2. EXCAVATION

Sr. No.	Factors	Manually	Automated
1.	Bucket Capacity	It needs more labours.	Bucket capacity – Max. 1 cu.m Digging depth- 22 ft.
2.	Horizontal Reach	It needs more time.	32 ft. hence needs very less time.
3.	Max. lifting Height	More labour there will be more cost.	31 ft.
4.	Swing speed	No timely completion.	Swing speed – 13rpm Time per swing – 35 sec.
5.	Capacity	3cu.m/day/person .	150cu.m/hour.
6.	Labours required	More labour required.	Only one operator is required.

3. BOOM PLACER

Sr. No.	Factors	Manually (Concreting Pump)	Automated (Boom Placer)
1.	Capacity	14-15 cum/hr	120 cum/hr
2.	Labour Required	More Labour Required	Skilled Operator And Unskilled labour Required
3.	Time Required	More	Less
4.	Cost Required	More	Less
5.	Work Quantity	Less	More
6.	Compaction	More Compaction is Required (Vibrator)	Less Compaction Required.

6. CONCLUSION:

From the above project data we concluded the following points,

- By using automation and robotics in the field of construction, the project can be completed in the targeted time as well as budgeted cost which is assigned to the project.
- Also the quality of the work is very fine as compare to manual workmanship.

7. ACKNOWLEDGEMENTS

We would like to thank our Principal of institute Prof. Dr. D. D. Shah, HOD Civil Department Prof. Dr. A. W. Dhawale and Prof. Dipak Patil co-operative guidance, all faculty members for their support.

REFERANCES

An Investigatation into the barriers to the implementation of automation and robotics technologies in the construction industry. ROHANA MEHBUB Bsc (Hons) Quality Surveying, University of reading Msc Construction Project Management, UMIST 2008.

Application of Robotics in Mining Industry: A Critical Review Santosh Kumar Nanda* Ashok Kumar Dash** Sandigdha Acharya* Abikshyana Moharana* Year 2010.

AUTOMATION IN CONSTRUCTION INDUSTRY Divyesh Joshi1, Rushabh Shah2 M.E. Student, Civil Eng. Dept., SNPIT &RC, Umrakh (GTU), Bardoli, Gujarat, India1 Asst. Professor, Civil Eng. Dept., SNPIT &RC, Umrakh (GTU), Bardoli, Gujarat, India 2009.

ROBOTS AND CONSTRUCTION AUTOMATION By Guillermo Morales, Master of Engineering, billmorales uhotnrail.com Dr. Zohar Herbzman, Associate Professor, zherb (ace.ufl.edu Dr. Fazil T. Najafi, Associate Professor, 1999.Automation and Robotics in Construction: Social and Cultural Differences between Japan and the United States by John G. Everetta and Hiroshi Saitob 1994

Survey on automation of the building construction and building products industry Pentti Vähä, Tapio Heikkilä, Pekka Kilpeläinen, Markku Järviluoma & Rauno Heikkilä. 2013.

Corresponding Author

Prof. Dipak P. Patil*

Assistant Professor, JSPM's Imperial College of Engineering and Research, Wagholi, Pune

E-Mail – dipo531@gmail.com