Improvement of Productivity in Construction Sector using Automation Technique
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Abstract: The main purpose of this study is to provide more precise and uniform quality of construction through automation techniques. A review of literature is conducted to determine the factors that influence productivity of construction projects through productivity evaluation checklist. Analysis of formulated check list through data collected from Engineers, contractors labours etc. The best suggestive measures will be given for productivity improvement in construction industry through automation techniques. Which finally declines higher cost, and increases efficiency and productivity of the project.

Keywords: Construction 1, Productivity 2, Improvement Techniques3, Automation4, Evaluation5.

1. INTRODUCTION
Productivity is at the forefront of concerns facing professionals in the construction industry worldwide. This study highlights the factors affecting productivity of the Construction industry. A questionnaire was used to gather the relevant data from the study area. The top three factors affecting construction productivity are: Management of productivity, Human factors, and External factors. The construction sector gives second largest employment after agriculture. India shares about 8% of total GDP and also provides employment to around 35 million peoples directly or indirectly. The Construction industry of India is an important indicator of the development as it creates investment opportunities across various related sectors. Construction industry is world's most largest and challenging industry. Human resource has a strategic role in increasing productivity in construction industry. With the effective and optimum use of human resources can help in productivity growth. Background of construction industry and productivity is given and also explained, how low productivity affects the time and cost of construction project. Many researchers have shown that poor construction management practices leads to poor performance, wastage of efforts in different phases of construction projects. Researchers tried to overcome some of challenges by adding their efforts in construction project, however many problems are yet to be solved in terms of construction productivity. Identifying and analyzing the critical factor that influence construction productivity will lead to develop most effective method and strategies to improve the construction productivity in upcoming time. Construction project is said to be successful if it is completed in schedule duration and estimated cost. For that purpose productivity has to be efficient. Productivity forecasting plays an important role in strategic and operational planning. Productivity is one of the key components of every company's success and Competitiveness in the market. Productivity translates directly into cost savings and profitability a construction contractor stands to gain or lose, depending on how well his company’s productivity responds to competition. The growth of infrastructure and development in emerging countries like India may require the construction industry to shift from traditional methods of construction to modern ones in order to improve productivity and enhance performance.

1.1 Benefits of Productivity
Higher productivity benefits all. These direct beneficiaries are the workers of the company, the company itself and its customers. Productivity growth leads to lower costs which in turn enable:
(a) Higher wages, larger bonuses and better benefits for workers
(b) Greater competitiveness and higher profitability for companies
(c) Cheaper and better quality goods and services for customers.
(d) Short construction period.
(e) Improvement of construction environment.
(f) Foster communication and co-ordination.

2. AUTOMATION TECHNIQUE USED IN FORMWORK

2.1 Aluminum Formwork: Mivan
The panels of aluminum formwork are made from high strength aluminum alloy, with the face or contact surface of the panel, made up of 4mm thick plate, which is welded to a formwork of specially designed extruded sections, to form a robust component. The panels are held in position by a simple pin and wedge arrangement system that passes through holes in the outside rib of each panel. The panel fits precisely, securely and requires no bracing. The walls are held together with high strength wall ties, while the decks are supported by beams and props. Since the equipment is made of aluminium, it has sections that are large enough to be effective, yet light enough in the weight to be handled by a single worker. Individual workers can handle all the elements necessary for forming the system with no requirement for heavy lifting equipment or skilled labor. By ensuring repetition of work tasks on daily basis it is possible for the system to bring assembly line techniques to construction site and to ensure quality work, by unskilled or semi-skilled workers.
Trial erection of the formwork is carried out in factory conditions which ensure that all components are correctly manufactured and no components are missed out. Also, they are numbered and packed in such a manner so as to enable easy site erection and dismantling.

Figure 1. Aluminum Formwork Used in Malad Mumbai

2.1.2 Components of Aluminum Formwork

The basic element of the formwork is the panel, which is an extruded aluminum rail section, welded to an aluminum sheet and other components are extruded section. This produces a lightweight component with an excellent stiffness to weight ratio, yielding minimal deflection under concrete loading. Panels and extrusions are manufactured in the size and shape to suit the requirements of specific projects. Following are the components that are regularly used in the construction.

1. Slab Components
   • Slab Panel (SP)
   • Slab Prop Head (SPH)
   • Mid / End Beam (MB / EB)
   • Slab Corner (SC)
   • Beam Splice Bar (BSB)
   • Prop Length (PL)

2. Wall Components
   • Wall Panel (WP)
   • External Corner (EC)
   • Rocker (RK)
   • Internal Corner (IC)
   • Kicker (K)
   • Pin and Wedge

2. Beam Components
   • Beam Panel (BP)
   • Bulk Head Horizontal (BHH)
   • Beam Prop Head (BPH)
   • Soffit Corner Internal (SCI)
   • Beam Soffit Panel (BSP)
   • Soffit Corner External (SCE)

2.1.3 Cost Comparison Between Conventional and Aluminum Formwork System

In typical floor construction, around 20 percent of cost saving is possible in box type structure over framed structure. Almost 40 percent savings in project duration in Box type structure over framed structure. Construction cost escalation, Labor rates increases every year at the percent of 2 to 5.Cement and steel price increases every year at the percent of 10 to 15.Around 5 to 8 percent Savings in project cost is possible on reducing over heads by early completion of projects. High return on investment is possible.
2.1.1 Comparison

<table>
<thead>
<tr>
<th>Factors</th>
<th>Mivan Formwork System</th>
<th>Conventional System</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Speed of development</td>
<td>7 days cycle per floor.</td>
<td>Min. process duration is of 21 days.</td>
</tr>
<tr>
<td>2 Quality of surface finish</td>
<td>Excellent. Putting is not required</td>
<td>Bad. Putting is required</td>
</tr>
<tr>
<td>3 Pre-planning of formwork system</td>
<td>Required</td>
<td>Not required</td>
</tr>
<tr>
<td>4 Type of construction</td>
<td>Cast-in-situ Cellular construction</td>
<td>Simple RCC encircled development</td>
</tr>
<tr>
<td>5 Wastage of formwork material</td>
<td>Very less</td>
<td>In incredible sum.</td>
</tr>
<tr>
<td>6 Accuracy in construction</td>
<td>Accurate construction</td>
<td>Accuracy is Less than Modern Systems</td>
</tr>
<tr>
<td>7 Coordination between various offices</td>
<td>Essential</td>
<td>Not essentially required</td>
</tr>
<tr>
<td>8 Resistance to earthquake</td>
<td>Good resistance</td>
<td>Less than Modern Systems</td>
</tr>
<tr>
<td>9 Removing of floor piece frames without expelling props</td>
<td>Possible</td>
<td>Not possible</td>
</tr>
<tr>
<td>10 Need of any timber or plywood</td>
<td>Not required</td>
<td>These are the main components</td>
</tr>
<tr>
<td>11 Re-use estimation of formwork</td>
<td>150 – 200</td>
<td>Maximum 50</td>
</tr>
<tr>
<td>12 Stacking of materials</td>
<td>Hard</td>
<td>Easy</td>
</tr>
<tr>
<td>13 Initial investment in the system</td>
<td>High</td>
<td>Less</td>
</tr>
<tr>
<td>14 Economy in development</td>
<td>Economical for mass housing</td>
<td>Economical on small scale</td>
</tr>
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</table>

3. CONCLUSION

It can be concluded that the modern methods of construction such as 'Mivan formwork system' are the key to meeting the demand for efficient, sustainable housing. Also the quality and speed must be given due consideration with regards to economy. Mivan formwork system not only helps in improving the quality and efficiency of the work but also has helped in maintaining the site safety. Traditional formwork for concrete construction normally consisted of bespoke solutions requiring skilled craftsmen. This type of formwork often had poor safety features and gave slow rates of construction on-site and huge levels of waste – inefficient and unsustainable. Modern formwork systems, which are mostly modular, designed for speed and efficiency. They are engineered to provide increased accuracy and minimize waste in construction and most have enhanced health and safety features built-in. By using MIVAN system we can achieve cost reduction in less time. By reducing cycle time than conventional method overall financial cost saving can be achieved.

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4. REFERENCES


