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Aluminium Formwork Technology

Himanshu Rivankar, Akshay Chordiya

P.G. Student, Department of Civil Engineering (Construction Management) MIT College of Management, Pune, India.
P.G. Student, Department of Civil Engineering (Construction Management) MIT College of Management, Pune, India.

ABSTRACT: Now-a-days due to globalization, the construction industry has started focusing on new innovative ways of working. The construction industry has started adopting new technologies and approaches in order to increase the overall efficiency of the project. **Formwork**, which holds and supports wet concrete till such time it cures, is a very vital element in concrete construction. This paper aims to compare merits and demerits by using a conventional timber formwork system and modern Aluminum formwork systems. The comparisons include costs, time, and quality of these systems. **Aluminum Formwork technique** in construction industry in developed countries has improved the standard of the construction industry.

KEYWORDS: Conventional Technique, Aluminium Formwork Technique, Cost, Quality, Time, Trend.

I. INTRODUCTION

The construction industry is one of the biggest industries in the whole world. The contribution of this industry towards the global GDP is enormous. In recent years due to globalization and advancement in technologies there has been a tremendous development in the construction industry. However despite of the boom in construction activities the scenario on the housing front remains far from satisfactory.

Due to ever increasing population in countries there is an overgrowing demand for housing. Now keeping in view the gigantic task of providing affordable shelter to masses, adoption of modern and cost effective technology assumes greater significance.

Formwork system has significant role in the construction process, making the right decision by choosing the appropriate formwork system could lead to response to sustainable construction. Different systems have their own advantages but one needs to choose a formwork which best supports individual project requirement.

The **Aluminum Formwork System** was developed by **W. J. Malone, a Canadian Engineer** in the late 1970s as a system for constructing low–cost housing unit in developing countries. The units were to be of cast-in-place concrete, with load bearing walls using a formwork of aluminum panels. To be erected by the hundreds, of a repetitive design, the system ensured a fast and economical method of construction

The technology has been used extensively in countries such as Europe, Gulf Countries, Asia and all other parts of the world. This technology is suitable for constructing large number of houses within short time using room size forms. In this system of formwork construction, cast - in - situ concrete wall and floor slabs are casted monolithically in one continuous pour. Large room sized forms for walls and floors slabs are erected at site. These forms are strong, easy to handle and are fabricated with accuracy. They can be used repetitively around 150times.

Aluminum formwork system is construction system for forming cast in place concrete structure of building. It is also a system for scheduling and controlling the work of other construction trends such as steel reinforcement, concrete placement and mechanical and electrical conduits. This type of construction requires a restructuring of the entire conventional construction process to enable interaction between the design phase and production planning in order to improve and speed up the construction.

II. TECHNOLOGY

Aluminium Formwork System is highly suited to load bearing wall construction whereas traditional formwork consisting of plywood and timber is not suitable to the high pressures of fresh concrete on the wall.

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COST: Use of this formwork in load bearing design gives an average of 15 per cent cost saving in the structure of the building and increased usable floor space of 8 per cent over RCC design.

TIME: For 100 per cent work, construction through slab beam wall construction takes X time and through Aluminium Formwork technology the time required is 1/6th of the X time.

ENVIRONMENT FRIENDLY: The technology is environment friendly as there is no use of timber. The formwork gives the box or cellular design resulting in the walls giving support to the super structure in two directions. As a result, the structures are more resistant to earthquakes than the traditional RCC column and beam designs.

LIFTING: As the Aluminium Formwork is lightweight, no tower cranes are required for the same unlike in tunnel framework.

LABOURS: Due to simplicity of the assembly, only unskilled labors are required with minimal supervision.

REPETITIONS: The Aluminium Formwork System is removable and can be reused hundreds of times with little maintenance.

SCRAP VALUE: Moreover, the requirement of steel is also reduced in this technology as aluminum has a higher scrap value.

III.EXPLANATION

Fig 1.01 Components of Aluminum Formwork

The above figure 1.01 shows the various components used in the aluminum formwork system. All the components are properly manufactured in the factory as per the dimensions provided by the architect. These components and buffed for any deviation during transportation at site.

These components are installed after the 1st slab casted in conventional formwork to avoid any change in the footprint of the structure to be constructed. The following figures shows the various internal fittings used to assemble the formwork into correct posture.

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Wedge pins Tie rods

Fig 1.02 Components of aluminium formwork for support and connections

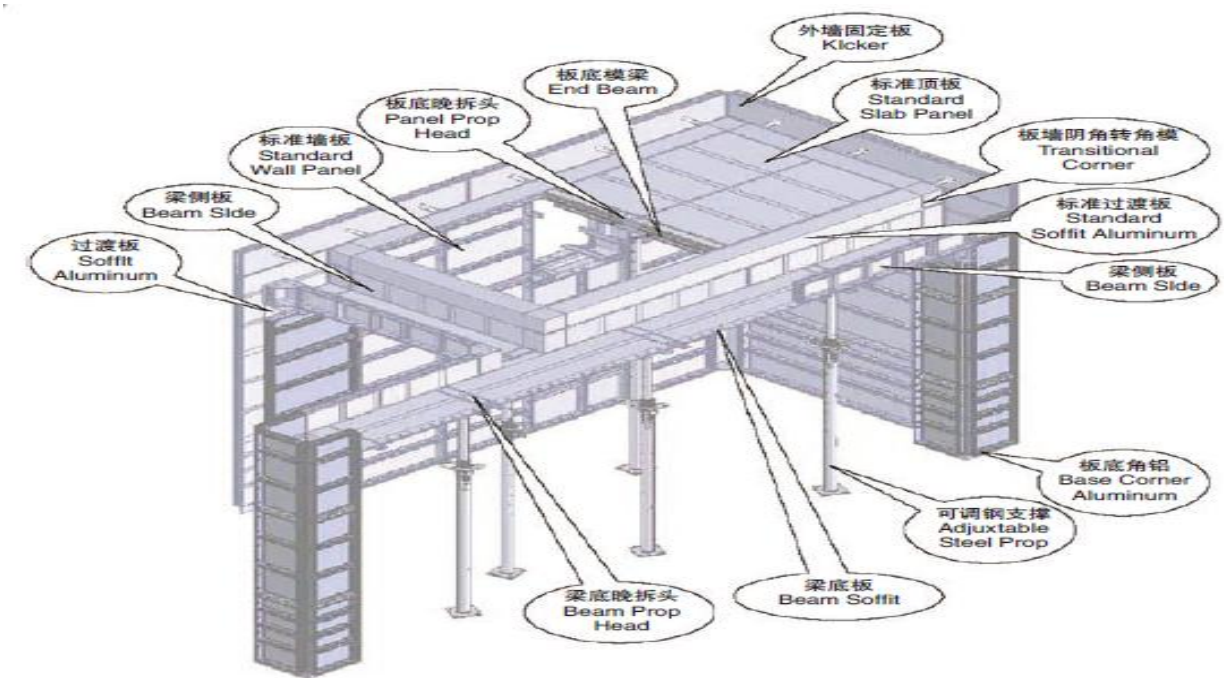

Fig 1.03. Typical Diagrammatic explanation of erection of Aluminum Formwork

The components are interconnected to each other and also designed in the same perspective. The different components are named or numbered according to the series of their construction erection progress and should be done in the similar way. This makes it easier for the supervisor to understand the errors to be minimised during erection.

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Fig 1.04.Elevation & Bird View of Aluminum Formwork Slab Construction

Fig.1.05. Concreting of Slab with RMC in Aluminum Formwork

Since the construction in aluminium formwork becomes a monolithic structure, the columns, beams and slab are casted together in a stretch which brings up the need of RMC for the construction purpose.

It is a good or healthy sign for the construction industry because the properties of the concrete are as desired and cannot be altered, and appropriate strength can be achieved significantly.

The following chart shows the slab cycle for construction in Aluminium formwork, showing the minimum required cast for casting a slab in such formwork proving time efficient factor.

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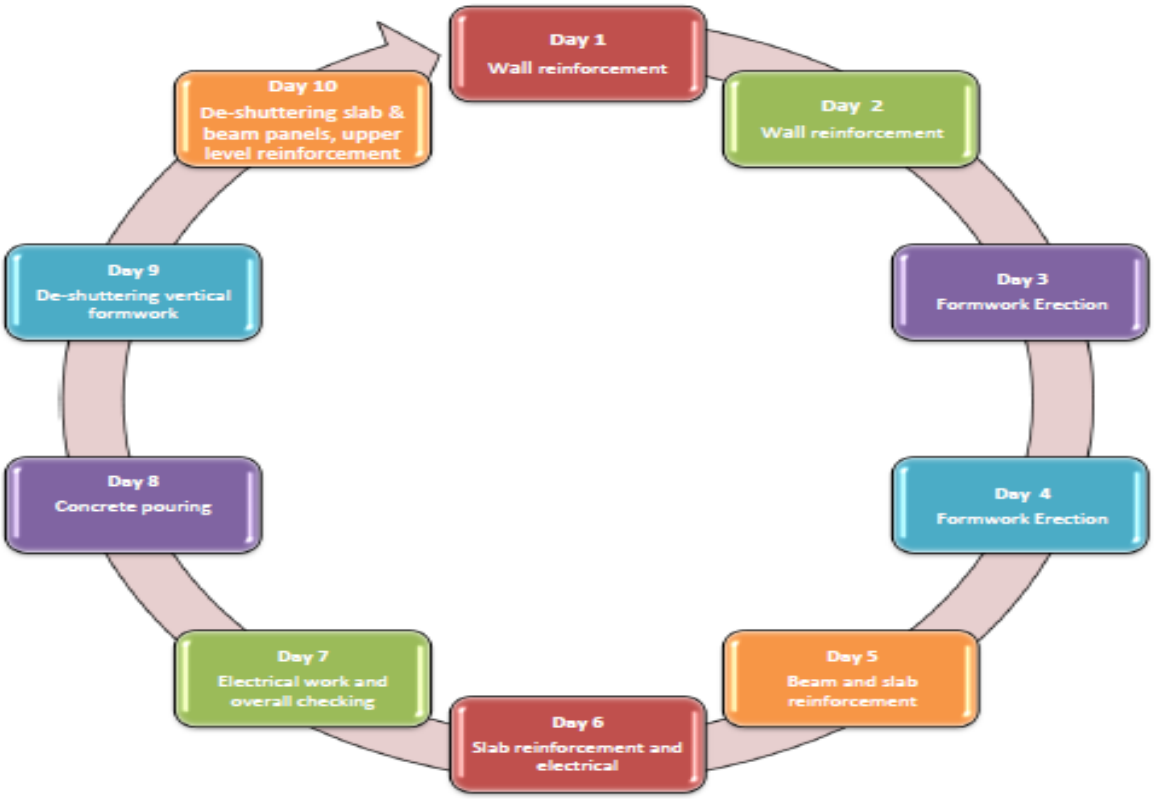

Fig 1.06 Slab Cycle for Aluminium Formwork

IV. COMPARISON

Comparison Chart for Aluminiumvs Conventional Formwork

Sr. No	Description	Aluminium Formwork	Conventional Formwork
1.	Quality of work	More	Less
2.	Time Taken for installation	Less	More
3.	Supervision required	Less	More
4.	Plastering	Not required	Required
5.	Initial Cost	More	Less
6.	Scrap Value	High	Less
7.	Finish of RCC Components	Smooth	Rough
8.	Monolithic Construction	Yes	No
9.	Slab Cycle	10 days	21days

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10.	Repetitions	150 time's	20 time's
11.	Suitability	Only high rise Bldg.	Any type of construction.
12.	Future Modifications	Less chances	More

V. MERITS AND DEMERITS

ADVANTAGES:

i. No plastering required.
ii. Savings on overhead expenses due to speedy construction (10 days per floor).
iii. Monolithic crack free structures.
iv. Doesn't require timber or plywood for construction activities.
v. Casting of walls and slabs possible simultaneously.
vi. Doesn't require skilled labour can be erected using unskilled labour.
vii. Floor slab forms removed without moving props.
viii. More seismic resistance.
ix. Uniform quality of construction.
x. Unsurpassed construction speed.
xi. High quality finish.
xii. Eliminates plastering.
xiii. Saves almost 50 percent construction time.
xiv. The system becomes cost effective where there is considerable repetition of floor layouts on a project such as in the case of low cost mass housing.
xv. Panels can be re used up to 150 times.
xvi. Requires no cranes or heavy lifting equipment.
xvii. Suitable for high rise buildings.
xviii. No need to use any timber or plywood.
xix. After the 25 cycles of reusing of our formwork system we will reach the breakeven point of the conventional formwork cost.

DISADVANTAGES:

i. Initial high investment.
ii. Compares very poorly on modifications, against brick work constructions.
iii. Heat of hydration is high due to shear walls.
iv. Fear of theft of valuable Aluminium Extrusions & sheets & hence kit not being complete at critical stages of construction.
v. Mass Housing projects are not as high for investing in large number of Aluminium Formwork.

VI. CONCLUSION

It is the need of time to analyze the depth of the problem and find effective solutions. Formwork technology serves as a cost effective and efficient tool to solve the problems of the mega housing project all over the world. It aims to maximize the use of modern construction techniques and equipment's on its entire project. This technology has great potential for application in India to provide affordable housing to its rising population.

Thus it can be concluded that quality and speed must be given due consideration with regards to economy. Good construction will never put off to projects speed nor will it be uneconomical. Thus, we can conclude that the overall cost of the project using Aluminium formwork technology is lesser when compared to project using traditional methods.

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AUTHOR'S BIOGRAPHY

Mr.Himanshu Rivankar received B.E.Civil Degree from Mumbai University with Distinction currently pursuing for Master's Degree in Civil(Construction Management) from MIT College of Management studying in 4 semester 2nd year 2017.

Mr. Akshay Chordiya received B.E.Civil Degree from Pune University currently pursuing for Master's Degree in Civil (Construction Management) from MIT College of Management studying in 4 semester 2nd year 2017.