TECHNICAL VISIT TO KNEST ALUMINIUM FORMWORK FACTORY, TALEGAON, PUNE

Organized by

INDIAN SOCIETY OF STRUCTURAL ENGINEERS (ISSE)

Prepared by

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A VISIT REPORT

Brief Background & acknowledgement

Indian Society of Structural Engineers (ISSE) Mumbai is a 27yr old professional institute based in Mumbai for Civil & Structural Engineers. It has centers in various parts of India and several student chapters. ISSE strive for excellence in civil / structural engineering by organizing seminar / workshops on various technical topics within civil / structural engineering. ISSE also publishes its own journal / bulletin apart from technical books / souvenir / seminar reports etc. ISSE regular arrange technical site visits to various construction sites – in past ISSE had organized visit to Golden Pagoda at Mira road and several other landmark structures.

On 21st June'2025 ISSE had organized one more such interesting site visits to Knest Aluminium factory located at Talegaon near Pune. I have a small attempt to cover the technical finding / learning acquired during this visit.

Along with me, my colleague in SGAWings Consultants, namely Er. Abhijeet Gawai, Er. Darsh Maru and one intern from IIT Madras (Er) Piyush Dalmia attended this visit.

I would like to express my deepest gratitude to – organizer of ISSE Mumbai and Mr. Mayur Tambe; organizers from Knest, Mr. Sagar Shinde, Er. Abhijeet Gawai and Er Vivek Abhyankar and all those who have guided, supported, and encouraged me throughout the preparation of this report.

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Overview of Visit:-

Members of the Indian Society of Structural Engineers (ISSE) had an opportunity to visit the Knest factory manufacturing of formwork located in Talegoan, Pune**.** The journey began from Mumbai (at Dadar TT followed by second stop at Vashi), at 8:00 AM in a vehicle arranged by organizers. After a comfortable ride, team reached at Knest factory at around 12:00 PM. Upon arrival, team was welcomed with refreshments and breakfast, followed by an induction program that introduced to the company's vision, operations, and safety protocols**.** The factory visit was both insightful and informative. Team was given a guided tour of two of their major production units — Factory 1 and Factory 3. Factory 1 showcased a semi-automated setup, where robotics are integrated into several key production stages, while Factory 3 is a fully automated facility, demonstrating advanced manufacturing processes with minimal human interventions.

During the visit, attendees gained valuable insights into aluminium formwork systems, the manufacturing workflow, and the various quality tests conducted on raw materials to ensure durability and precision. The visit provided us with a deeper understanding of how modern construction technologies are implemented at large scale, and how automation is enhancing efficiency in formwork production.

Overall, the experience was highly educational and enriching, offering a closer look into the innovative practices of one of India's leading aluminium formwork manufacturers.

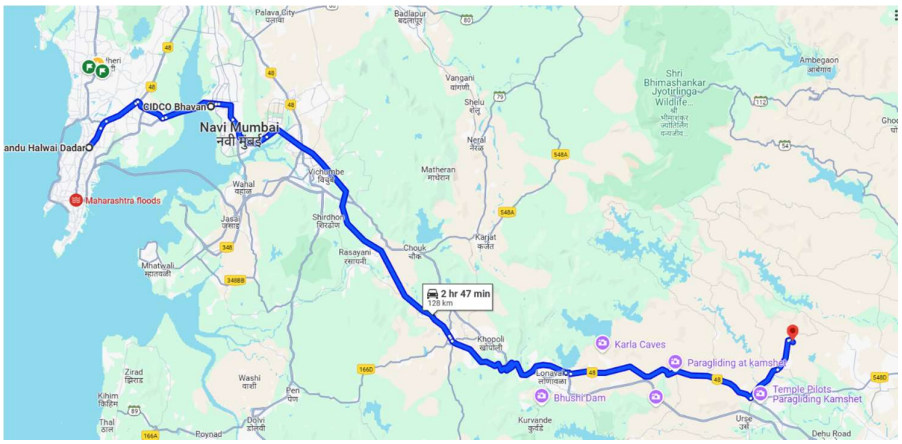


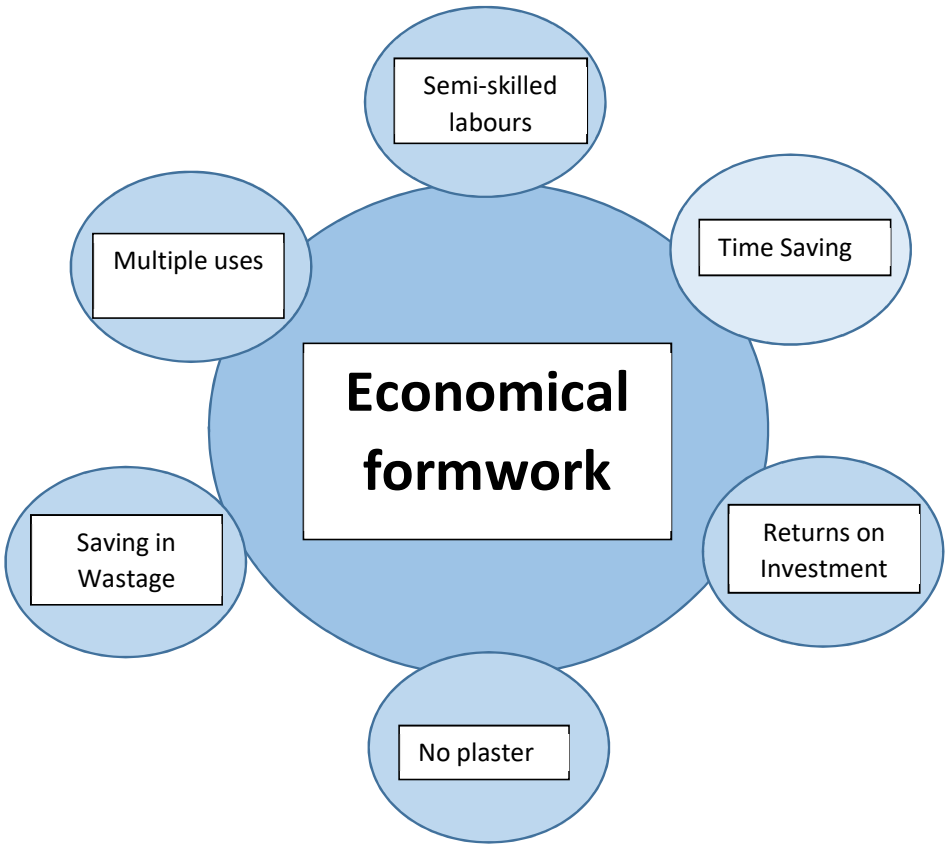
Fig 1: Route from Mumbai to Knest Factory Talegoan

General about Aluminium Formwork & Knest:-

Knest is a leading aluform company that provides innovative construction solutions to real estate and infrastructure development projects worldwide. Founded in 2014, Knest was established with the core vision of creating an efficient construction ecosystem through best-in-class aluform technology. The company uses only virgin aluminium, ensuring superior quality and durability. Specifically, Knest utilizes the high-strength aluminium alloy 6061-T6, known for its excellent mechanical properties, corrosion resistance, and suitability for structural applications. This commitment to quality materials guarantees long-lasting and reliable formwork systems, making Knest a trusted name in modern construction. Knest has a team of over 120+ designers dedicated to collaborative creation and offering the freedom to customize formwork solutions as per project requirements. Knest has its corporate head office located in Pune, Maharashtra, while an additional branch office is situated in Mumbai. The company's state-of-the-art manufacturing facility for formwork systems is located in Talegoan, near Pune. This expansive factory is spread across over 500,000 square feet, enabling large-scale and efficient production. Knest currently achieves a monthly production capacity of more than 150,000 square meters of formwork, catering to the growing demands of the construction industry with precision and consistency. Knest supplies aluform solutions across the globe, including countries such as Saudi Arabia, Sri Lanka, Bangladesh, Singapore, and others. Knest has clients that includes some of the most renowned names in the construction and real estate industry, such as DLF, L&T, Lodha, Tata Projects, Shapoorji Pallonji, Runwal, My Home Group, Sobha, Adani Realty, and many others.

(Above facts & figures are taken from website of M/s Knest)

After a safe and comfortable journey, team reached the Knest factory at around 12:30 PM, where attendees were warmly welcomed by the Knest team. Upon arrival, were offered refreshments and breakfast, which was much appreciated after the travel. Following the breakfast, an induction program was conducted. During this session, Mr. Ralph Craven and Mr. Nilesh Birraris delivered an excellent presentation on aluform. Their presentation covered a range of important topics, including the following:



Conventional Formwork	Aluform
Plastering required	Smooth Finish – no plaster is needed
Cranes required	No requirement of crane
Slab cycle is of 21 to 28 days	Slab cycle reduce o 7-8 days
Requirement of plywood	No Requirement of plywood (sustainable construction)
Skilled labour's required	Semi-skilled labour required
Brick block required	Wall are of RCC

Platform and PSS (protective safety screen):-

Apart from aluform systems, Knest also provides advanced safety platform solutions for workers operating at heights in high-rise construction projects. These platforms are specially designed to enhance both safety and operational efficiency on construction sites. The system features a protective steel mesh platform, commonly known as a "PSS", which is installed around the periphery of the building *(refer fig: 2 & 3)*. This PSS is constructed using 4 mm thick steel mesh and stands at an approximate height of 10 meters, serving as a robust vertical barrier to prevent falls and protect workers from external hazards. The entire structure is supported and secured using connecting arms, ensuring stability during operation. A key advantage of this system is its mobility—the complete PSS setup can be easily lifted from one floor to another using hydraulic jacks. During the lifting process, each jack is designed to withstand a load of approximately 1.5 tons, ensuring safe and reliable movement.

To further enhance safety, wind sensors are integrated into the system. These sensors continuously monitor wind speed and conditions at height. In the event of high wind speeds or hazardous conditions, the system automatically issues warnings to workers, allowing them to take necessary precautions or pause operations to prevent accidents. This comprehensive safety platform reflects Knest's commitment to worker protection, technological innovation, and modern construction standards. After the completion of the induction program, helmets and safety jackets were provided to all participants in accordance with safety protocols. ISSE members, were then divided into groups for the factory tour. Each group was accompanied by two representatives from the Knest team, who guided us through the manufacturing processes and patiently addressed all our queries.

Fig 2: Setup of Working Platform with PSS (Demo sample).

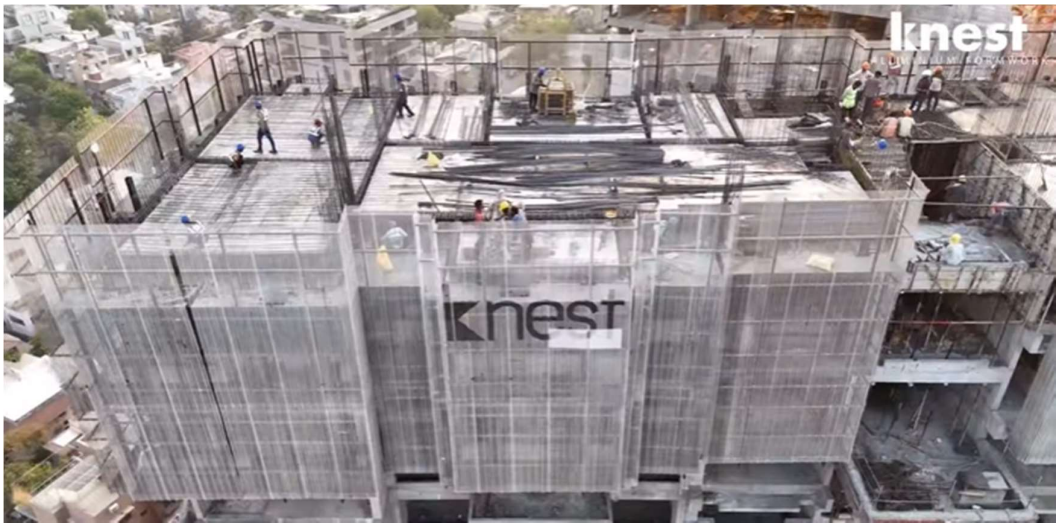


Fig 3: Setup of Working Platform with PSS (on site image).

Team got opportunity to visit Factory 1 and Factory 2

Visit to Factory 1:-

Team firstly had the opportunity to visit Factory 1**,** where there was semi-automated production process of aluform. The facility demonstrated a blend of manual operations and robotic assistance, showcasing how technology is integrated to improve efficiency and precision in manufacturing.

Process-

At the beginning of the manufacturing process, when raw materials arrive at the factory**,** a thorough quality testing procedure is carried out. From each batch, specimens are randomly selected for testing, following the guidelines laid out in BS EN 573 codes to ensure accuracy and consistency in sampling.

Step 1 (Quality Check):-

There are two primary types of testing performed: chemical testing and mechanical testing *(refer fig 4)***.** Chemical testing is conducted first to verify the material composition and ensure that it meets the required specifications and standards. This step is crucial in maintaining the overall quality and performance of the final product.

Chemical test:-

- Burn Mark Test.

Mechanical test:-

- Brinnell Hardness Test.
- Tensile strength

Fig 4: Brinnell Hardness Test.

All the above tests are conducted in-house at the factory by the Quality Department team**.** Once the internal quality checks are successfully completed and the material is approved by the Quality Department, samples are then sent to third-party laboratories for external verification.

If the third-party test results confirm the quality and chemical composition of the raw material, the batch is approved and accepted by the manufacturing team for further processing. However, if the material is found to be defective or contains an improper chemical **c**omposition, the entire batch is rejected and returned to the supplier.

Step 2 (Cutting):-

Fig 5: Plasma Cutting.

After the raw material passes all quality checks**,** it is then cut into specific shapes and sizes according to the design requirements and panel specifications**.** This cutting process is a critical step in the preparation of aluminium panels and other structural components**,** ensuring that each piece aligns precisely with the project's design and assembly standards *(refer fig:5).* To achieve this level of accuracy and efficiency, plasma cutting technology is

also employed. Plasma cutting enables clean, precise, and high-speed cutting of aluminium, making it especially suitable for complex shapes and large-scale production in formwork manufacturing.

Step 3 (Welding):-

Fig 6: Friction Stir welding.

For the joining of aluminium components, Knest uses a specialized and advanced welding technique known as Friction Stir Welding (FSW). This solid-state welding process is particularly effective for aluminium, as it creates high-strength, defect-free joints without melting the base material. In this process, the aluminium members to be joined are firmly clamped and pushed together *(refer fig: 6)*, while a rotating cylindrical tool (or pin) is applied at the joint line. The friction generated by the rotating tool produces localized heat, which softens the material just enough to allow for plastic deformation and bonding—without reaching the melting point of base material. As the tool moves along the joint, it mechanically stirs the softened material, resulting in a strong, continuous, and precisely aligned weld. This technique is ideal for aluform manufacturing, offering excellent precision, durability, minimal distortion, and preserving the integrity of the material.

Fig 7: Hole Punching.

Step 4 (Punching):-

After the completion of the welding process of main members, the components undergo the punching operation. Using high-precision punching machines, holes are created at designated positions based on the

required locations for bolts, pins, or fasteners *(refer fig: 7)***.** This step is essential to ensure accurate alignment and easy assembly of the formwork components at the construction site, maintaining consistency with the design specifications.

Step 5 (Welding by Robotic Arm):-

After the punching process**,** additional components such as stiffeners and other structural elements are welded onto the panels. These components provide extra strength, stability, and durability to the formwork system. To ensure proper welding around the entire periphery of the panel, the members are manually rotated by workers, allowing welders to access all sides effectively. This step is crucial for achieving uniform weld quality and structural integrity across all joints.

In Factory 1**,** Observed that all workers were strictly following safety protocols**,** wearing appropriate personal protective equipment (PPE) such as helmets, jackets, gloves, and safety shoes. The factory premises were also well-organized and maintained in a very clean condition**,** reflecting Knest's commitment to both safety and workplace hygiene. With this, visit to Factory 1 was successfully completed**.**

Factory Visit 3:-

After completing visit to Factory 1, team travelled to Factory 3 by bus continuing tour of Knest's manufacturing facilities.

At Factory 3, the manufacturing procedures observed were similar to the Factory 1 but fully automated. Only raw materials batch which pass the test arrives in this factory 3 and the product is the output in an automatic way or less human intervention, ensuring consistent quality standards across both facilities.

Step 1 (Cutting of Raw material):-

After the raw material is tested and approved in Factory 3, it is cut into standard lengths and sizes using plasma cutting machines.

Step 2 (Friction Stir Welding):-

The same welding process—Friction Stir Welding (FSW)—is used for joining aluminium components. However, in Factory 3 this process is fully automated which ensures greater precision, consistency, and operational efficiency**.** As a result, the joints between components are seamlessly integrated**,** making the entire member monolithic in nature *(refer in fig 8)***.**

Fig 8: Friction Stir welding.

This significantly reduces the chances of weak sections in the components, thereby enhancing the overall strength and durability of the final product.

Step 3 (Punching 1 & 2):-

In Factory 3**,** there are two dedicated punching units. First, the panel is positioned at Punching Unit 1**,** where holes are punched on one side of the panel. The panel is then automatically transferred to Punching Unit 2 with help of roller**,** where punching is carried out on the other side**.** Throughout this process, the panels are firmly held in place using stoppers to ensure accurate alignment and positioning. Any waste material generated during the punching operation is collected and sent to the scrap section**.**

Step 4 (Slotting milling):-

Slotting is the process of creating grooves or slots in formwork members *(refer fig: 9)*. These slots are designed to accommodate small strips of plates, which serve the purpose of maintaining the required thickness of walls or other structural elements during concrete casting. This ensures dimensional accuracy and helps in achieving the desired specifications of the final construction.

Fig 9: Slot milling.

Step 5 (Buffing):-

Buffing is the process in which panels are given minor surface notches or roughness to enhance surface coating and act more effectively during the lacquering process. This surface preparation step ensures that the lacquer bonds properly, resulting in a smooth, durable, and long-lasting finish on the aluform panels.

Fig 9: Lacquering.

Step 6 (Lacquering):- Lacquering is the process of applying a protective coating to the surface of the formwork panels (refer fig: 9). This coating serves as a non-stick layer, preventing concrete from adhering to the aluminium during casting. As a result, it ensures easy demolding, enhances the longevity of the formwork, and maintains a smooth finish on the concrete surface. Typically, this protective coating remains effective for 2 to 3 repetitions**.**

Fig 10: Printing Barcode.

Step 7 (Embossing QR codes):-

After the lacquering process, a QR code is embossed on each panel *(refer fig: 10)*. When scanned, this code provides comprehensive information about the project, including panel specifications, manufacturing details, project site, and usage instructions**.** This system ensures traceability**,** improves inventory management**,** and enhances coordination between manufacturing and site teams**.**

Here the panels gets ready.

Step 8 (Modification for panel):-

Once the panel is fully prepared, it is transferred to the next unit**,** where final cutting and welding operations are carried out. Plasma cutters are used for precise trimming as per the design requirements, while robotic arms perform welding tasks that is tungsten inert gas weld (TIG) and metal inert gas weld (MIG) are use with high accuracy and consistency *(refer fig: 11)*. At this stage, stiffeners are also attached to the panels to enhance their structural strength and stability**.**

Fig 11: Welding of Panel and Stiffeners.

After all modifications and finishing processes are completed, the packing of the formwork components is carried out. Each member is carefully packed to ensure protection during handling and transportation**,** minimizing the risk of damage. Proper labeling and identification are also done at this stage to ensure accurate delivery and easy tracking at the project site.

A physical sample model of the aluform system manufactured by the Knest team was displayed. This model provided us with greater clarity and understanding of how all the individual components fit together and function in a real construction scenario. It was a valuable visual aid that helped reinforce the knowledge attendees had gained during the visit.

Clicked few photos of all attendees and Knest Team together.

Fig 12: A group photo inside factory with all visiting staff & sample formwork system.

Fig 13: A group photo at entrance of factory 3.

After completing our visit to Factory 3, team returned to the main hall, where lunch was waiting for us after this factory visits**.** Following lunch, a Q&A session was conducted, during which some of our members raised doubts and queries related to the processes and systems observed during the visit. The Knest team addressed all our questions regarding the typical formwork ready period, where they say a formwork system take around 75-90 days to get on site. Its flexibility if there are any minor changes in building plans. Also they highlighted how FSI affects, but once the shell plan is locked, manufacturing of components starts and then no major changes can be adopted, a whole lot of manufacturing has to be stopped. They addressed most solutions with clear and satisfactory answers, demonstrating their technical expertise and commitment to knowledge sharing.

After the Q&A session, a felicitation program was held and a token of appreciation were given to all the visitors.

With this, our visit to the Knest factory came to an end, and would like to extend my sincere thanks to ISSE and the Knest team for organizing this insightful and well-coordinated technical tour**.** This visit not only enhanced our understanding of modern formwork systems but also changed my perspective on how advanced, efficient, and technology-driven the formwork industry has become.

Key Takeaways:-

- **Gained Practical Exposure:** The visit provided real-world insight into the complete manufacturing process of aluform —bridging the gap between theory and practice.
- **Understanding of Modern Construction Methods**: Learned how aluform systems are revolutionizing construction by enabling faster slab cycles (7–8 days) compared to conventional methods.
- **Advanced Manufacturing Techniques**: Observed high-end processes like Friction Stir Welding (FSW)**,** plasma cutting**,** automated punching, and robotic welding**,** which ensure high precision and quality in production.
- **Quality Control Knowledge:** Understood the importance of both in-house and third-party chemical and mechanical testing in maintaining material standards as per American codes.
- **Comparison with Traditional Formwork:** Clearly understood advantages over conventional formwork—like elimination of plastering, reduced labor requirement, reusability, and environmental sustainability.
- **Focus on Safety**: Impressed by the integrated protective safety screen (PSS) with wind sensors, hydraulic jacks, and safety platforms for high-rise construction—prioritizing worker safety.
- **Global Standards & Reach:** Realized Knest's capability to deliver large-scale, customized formwork systems both nationally and internationally with consistency.
- **Professional Environment**: Noted high standards of cleanliness, safety protocol adherence, and systematic workflow in all factory units, reflecting a strong industrial work culture.
- **Enhanced Technical Knowledge**: The visit significantly improved our technical understanding of formwork systems, structural detailing, manufacturing logistics, and on-site application.

******* End of Report ******