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A View of the Future: Drones in Construction Industry

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Abstract

Construction industry is in the phase of revolution and it is adopting the technology to improve the productivity, quality and lowering the risk. Now the construction industry is moving from resistant and unresponsive mindset to adopting the innovations. The present construction industry is embracing the technology and genuinely begins to deliver differently. There is an aerial revolution happening across the globe. Drones have emerged as a highly viable technical tool with applications in numerous sectors, most notably, construction. Their benefits range from on-site safety to a level of project monitoring which wasn't previously possible. The construction industry is transforming itself by using Drones to achieve quality monitoring, controlling on projects, enhancing safety, real time reporting and easy access to large or difficult sites. This research paper is putting a view on Drones in construction industry, its present uses, Indian laws regulating Drones and the future of Drones in the construction industry.

Keywords: Unmanned aerial vehicle, Aerial view, monitoring, controlling, safety enhancement, real time reporting, UIN, NPNT, 2D & 3D maps.

Introduction:

Drones or Unmanned aerial vehicles (UAVs) are finding increased popularity within the construction and engineering fields. In engineering, large firms are putting them to use in risky and unconventional settings; likewise, in the construction industry, this technology has been well-received due to the unprecedented level of data mobility, visualization, access and efficiency it lends to projects. Furthermore, drone technology has been shown to reduce costs associated with poor communications from the field, reduce material theft from the jobsite and increase worker safety. The latter is significant, given the fact that construction continues to be one of the most dangerous industries. The presence of drones in construction means significant changes within the industry. Drones have already begun changing the way the construction industry operates, and those changes will have continued and lasting effects.

Changes in Construction Industry:

Here's a look at some of the ways drones have already changed things and how these trends will impact construction operations in the future.

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Surveying Land

Unmanned Aerial Vehicles (UAVs) are rapidly replacing traditional land-surveillance methods. They are growing in popularity so rapidly that some have even abandoned the classic "bird's-eye view" expression with "drone's-eye view." Drones greatly reduce the labor and time involved in producing accurate surveys. Drones eliminate much of the human error involved in the process and have the ability to capture necessary data in much less time than traditional methods would take.

Improvements to Infrastructure

Drones provide superior endurance and intelligence on job sites. Their ability to collect and report data allows work to be completed faster. The need for manual labor is all but removed from the equation. In the future, drones will take on even more integral tasks involved in large projects.

They are poised to cut the time it takes to build a skyscraper by a broad margin, thereby cutting costs. Contractors who rely on drones will be able to make much more ambitious bids and complete work on time.

Communication and Management

Drone technology has evolved to the point where instant connectivity and communication on the job site are at a surplus. Drones are being used more and more as a means of maintaining constant contact at worksites. Drones that feature mounted cameras can provide video footage to facilitate communication and surveillance. They allow companies to keep tabs on employees and workers and are considered an increasingly invaluable tool for superintendents and investors.

Already, communication and management are seeing a sharp increase in efficiency due to the ability to collect real-time data from drones. The decrease in delays in gathering data is having more of an impact each day. The ability to manage workflow 24/7 is unprecedented and is certain to have a significant impact on all manner of construction processes.

Improved Overall Security

The advent of drones is causing a sharp increase in security efficiency. Whether the drones are used to maintain the safety of employees or to protect the job site from theft or vandalism, they are steadily seeing greater implementation in the construction industry.

Accurate Surveillance

Drones have the ability to be practically everywhere at the same time. They don't just reduce theft and keep workers safer; they create a round-the-clock real-time monitoring system that has already been adopted by a number of construction companies. They elevate onsite security and safety by a tremendous margin.

As of right now, they can be flown practically anywhere for any reason. Drones can also safely survey dangerous locations, reducing workplace accidents and increasing job site safety.

Transportation and Inspection

The use of drones in job site inspection also means a drastic increase in worksite safety by eliminating numerous dangers and safety hazards. Using drones to transport goods aerially allows companies to execute difficult inspections and keep track of everything that enters and leaves the job site. It saves money and time and keeps the site secure. Since drones are generally small with high levels of manoeuvrability, they are being used more and more as an alternative to traditional vehicles. Even better, drones do not have to adhere to traffic laws, which allow them to make deliveries in a fraction of the time, using half of the resources.

The construction industry is evolving at a rapid rate, and with all the innovations and changes to traditional methods comes the need for greater efficiency in every aspect of your business.

In the U.S. economy, In 2014, approximately 20% of worker fatalities were attributed to construction-related jobs. Overall, the benefits of using drones in the construction industry include: • Time-savings • Improved safety • Access to richer information • Improved decision-making. From public to the private sector, this technology is being used with promising results. As the use of drones for commercial and other activities grows in popularity, a simultaneous increase in regulations governing their use has been seen.

The Laws:

According to India's national aviation authority, the Ministry of Civil Aviation, flying a drone is legal in India. India's Directorate General of Civil Aviation announced the country's first Civil Aviation Requirements (CAR) for drones on August 27, 2018 to go into effect December 1, 2018. The full ruling is available in Section 3–Air Transport, Series X, Part I.

Based on research and interpretation of the laws, here are the most important rules to know for flying a drone in India.

- All drones except those in the Nano category must be registered and issued a Unique Identification Number (UIN).
- A permit is required for commercial drone operations (except for those in the Nano category flown below 50 feet and those in the Micro category flown below 200 feet).
- Drone pilots must maintain a direct visual line of sight at all times while flying.
- Drones cannot be flown more than 400 feet vertically.
- Drones cannot be flown in areas specified as "No Fly Zones", which include areas near airports, international borders, Vijay Chowk in Delhi, State Secretariat Complex in State Capitals, strategic locations, and military installations.
- Permission to fly in controlled airspace can be obtained by filing a flight plan and obtaining a unique Air Defense Clearance (ADC)/ Flight Information Center (FIC) number.

- Before every single flight, drone pilots are required to request permission to fly via a mobile app, which will automatically process the request and grant or reject it. India is calling their system "No Permission, No Takeoff" (NPNT). If a drone pilot tries to fly without receiving permission from the Digital Sky Platform, he or she will simply not be able to takeoff.
- Registration is required for all but the Nano category
- Foreigners are currently not allowed to fly drones in India. For commercial purpose, they need to lease the drone to an Indian entity who in-turn will obtain Unique Identification Number (UIN) and UAOP from DGCA.
- All drone operators will register their drone and request permission to fly for each flight through India's Digital Sky Platform. The Digital Sky Platform and further details will be available on the DGCA website from December 1, 2018.

Drone Categories in India

- Nano: Less than or equal to 250 grams (.55 pounds)
- Micro: From 250 grams (.55 pounds) to 2kg (4.4 pounds)
- Small: From 2kg (4.4 pounds) to 25kg (55 pounds)
- Medium: From 25kg (55 pounds) to 150kg (330 pounds)
- Large: Greater than 150kg (33 pounds)

Required Drone Equipment in India

Also worth noting is that India has specific requirements regarding the types of features a drone must have to be flown in India (excluding those in the Nano category). These mandatory requirements include:

- GPS
- Return-to-home (RTH)
- Anti-collision light
- ID plate
- A flight controller with flight data logging capability
- RF ID and SIM/No Permission No Takeoff (NPNT)

The Future:

Drones could soon be as commonly seen on construction sites as trucks and excavators as they can be used to help to better monitor and capture the construction of a project from inception to completion. Construction sites around the world depend on inspections and surveys to obtain a comprehensive look of a builds progress, and to ensure that strict safety standards are being met in the process. With cutting-edge drone technology, operators can now easily and quickly perform inspections in a cost-effective and efficient way, while also keeping employees away from dangerous environments or situations.

With data and imagery collected via a drone in the air, users can create 2D and 3D maps, orthomosaics, collect elevation data, and gather volumetric measurements to better plan for, build, and develop projects.

The high-quality information collected by a drone also give users the opportunity to view a site in real-time as it progresses, to better manage resources and keep projects on schedule. Additionally, drone technology gives those in the industry the valuable ability to view a project from the comfort of their office without having to physically step foot on a site. This way, many different parties can work together to easily track development and collaborate to improve decision-making.

Before drone technology, gathering aerial data and imagery was a difficult and expensive task in comparison to traditional on-foot or manned aerial vehicle methods. Now, a drone can quickly and easily perform an inspection of a job site in less time and at a lower cost than ever before. Additionally, with less time wasted on inspections, operators can maximize efficiencies and review projects without disrupting work, while also keeping extra personnel away from situations that could pose potential safety risks.

With pre-programmed flight paths that can be repeated on a daily basis, operators can view real-time imagery of projects as they are built to better monitor sites, optimize efficiencies, and quickly identify any problems before they develop, ultimately saving on expenses, avoiding wasted resources, and maintaining safety standards.

Drones are increasingly being used as a survey and inspection tool, to help operators record conditions of a job site from beginning to end. With a drone the amount of time spent collecting data can be cut in half, and the information collected can be generated into orthomosaics and geo-referenced digital images accurate to 1.5 cm per pixel.

A quick drone survey can benefit every stage of the construction process. Before construction begins, a drone can fly over a site to gather data and 3D maps of an area to better plan out a build. Once construction starts, daily or weekly autonomous drone flights can monitor the different stages of a build and help operators better manage their resources. Finally at the end of a build, drones imagery of the final product can be compared to original plans, or shared with clients for review or marketing purposes.

A drone can give users a clear picture to compare projects current conditions versus the original plans. With a drone users can also collect data to assess reference points, elevation models, break lines and contour lines, or even to calculate volumes of stockpiles.

With the information collected by a drone, clients, managers, and investors can easily observe a timeline of a sites progress to keep track of work being done. The data and imagery collected can be run through software that can then create models to compare original plans with construction work, to show users how a site is progressing, and what parts of a project may be falling behind. All of the information can then be reviewed from any office around the world, without anyone having to physically step foot on a job site.

3D maps, elevation data, volumetric measurements or orthomosaics can continuously be updated on interactive maps to give users better control over work progress and keep investors and clients in the know. By closely monitoring and analyzing up-to-date imagery and data, construction projects can save large amounts of time and money, while also improving communication and collaboration between different parties to enhance planning as a site grows, and improve decision making.

Drone technology is quickly advancing, and everyday more uses for these flying robots are being discovered. Particularly in the construction industry, drones can give users the ability to monitor and track construction progress in a way never before possible.

When it comes to the future of drone technology automation will be a key advancement. A drone will be able to automatically deploy, fly a pre-set route, and land all on its own. This way, 2D and 3D images of a job site can be collected and reviewed every day, allowing users to easily analyze and cross-reference progress.

The applications for drone usage in the construction industry are endless, and more and more, the industry is discovering the many ways the technology can be used to reduce expenses, save time, and prevent safety hazards. With drone technology continuing to rapidly advance, usage in the construction industry is projected to skyrocket as they help to reduce expenses, improve safety, and maximize efficiency.

Conclusion:

In the past few years, drones have become one of the most compelling construction trends. The industry has experienced a 239% growth in drone use year over year, higher than any other commercial sector. Their aerial vantage point and data collecting abilities make them a viable tool, offering benefits that range from on-site safety to remote monitoring. In particular, the benefits of drone technology have revolutionized the entire project lifecycle.

Newer drones can be equipped with tools to perform common construction tasks in addition to the tasks discussed earlier. Some of the "simpler" tasks include: tightening bolts and screws, moving and placing large sheets of metal, carrying spools of wire, laying pipes, taking photos and capturing video, working in spaces too small for humans

As the industry grows and construction projects become more complex, drones in construction will continue to skyrocket.

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