



Case Study on Rotating Building

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Abstract: The continuous evolution of traditional construction technique compels the new generation building technology to renovate the present thinking mode of static building into dynamic building behavior pattern. The building development of buildings' exterior structure and the variance in shaping has breakthroughs with the maturation of BIM technology. At present, with the renovation and evolution of building technology, the dynamic building mode of rotating building is shown up and innovated continuously in various countries. Therefore, this study aims to discuss the main building characteristics and key technical indicators of the future rotating buildings. The major technical projects implemented in the present rotating building construction cases in Taiwan and abroad are analyzed by literature review, case study and survey. Eight key technical indicators are found by statistical analysis and expert feedback of Delphi Method. The statistical analysis of case demonstration is carried out to demonstrate the research findings. The research findings can be used as theoretical reference for new building technology R&D. They can increase the substantive effectiveness of design construction and technical development of the future rotating buildings, so as to enhance the construction technique quality and management of the future rotating buildings, and to contribute to the national goal for sustainable green construction.

Keywords: Architecture, Dynamic buildings, infrastructure, sustainability, sustainable dynamic buildings..

I. INTRODUCTION

Rotating buildings, also known as rotating skyscrapers, are architectural structures that can rotate to varying degrees. These buildings often consist of floors or modules that can revolve independently around a central core. The concept aims to provide occupants with changing views and dynamic architecture. Notable examples include the Dynamic Tower in Dubai, designed by architect David Fisher, which was proposed to have rotating floors powered by wind turbines. Keep in mind that as of my last knowledge update in January 2022, the status and details of such projects may have evolved.

The rotating tower is designed by an architect David fisher in 2006. It is an 80 storey building which is 420 metres above the ground which can be able to rotate 360 degrees. The concept behind the rotating tower, it has multiple numbers of followers which can independently rotate with a common axis. The flowers are only attached with access and not with each other. Therefore the whole building can be transformed into various shapes. The original height of the rotating tower is 345 metres.

Initially, the construction of common access at the centre of the building takes place, then all the surrounding floor was should be constructed independently with each other. In this way, the whole building should be constructed and open for public use at the end of. Constructing a rotating building involves intricate engineering.

II. THE PURPOSE OF THE WORK

1. Clearly define what dynamic buildings are.
2. Considering sustainability to be a dynamic idea of design methodology and talk about it with pertinent examples
3. The importance of renewable resources without undervaluing the uses of contemporary technology.
4. Examining various models grounded on sustainable dynamic design and having access to various dynamic architecture applications.
5. Integrate sustainable architecture and dynamic construction by reaching sustainability criteria to meet the requirements needed to evaluate the dynamic integration of national projects still in the design and implementation stages.
6. Having access to a thorough guide on design criteria that will aid students and future architects in creating creative, sustainable structures for our country.



1) Dynamic rotating building

The Dynamic buildings are the one, which will be constantly in motion changing its shape. Italian experimental architecture company Dynamic Architecture has proposed a revolving sustain-able Dubai's skyscraper driven by wind turbines positioned, as depicted in figure , in between each storey. Because each story rotates independently, the building's profile will always be changing. Both this building and other structures will be able to use the electricity it generates. With no risk of pollution, 48 wind turbines installed between each revolving level and solar panels mounted on the building's roof will generate electricity from wind and sunlight.



FIGURE 1: DESIGNING CONCEPT OF DYNAMIC TOWE

2) Dynamic Architecture Examples

Certain buildings in the world have the ability to alter their configuration. Some floors at the summit of famous structures rotate, although this movement is hidden from view from the outside of the building; it occurs within the structure. This has mostly been done as tourist attractions, where people are drawn to the 360-degree revolving restaurants with views of the city

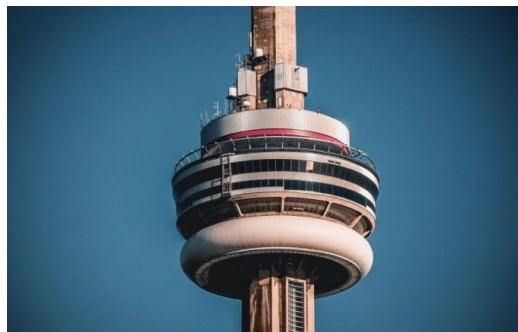


FIGURE 2: CN TOWER IN TORONTO, CANADA



Figure 3: WTC Mexico City



3) India's Need for Sustainability

India faces numerous environmental concerns, with pollution and the depletion of natural resources being the two main ones. Using various building materials, using machinery, demolishing old buildings, utilizing green spaces, cutting down trees, and other activities can all have an adverse effect on the environment when it comes to construction. Since the civil engineering sector accounts for a large portion of the Indian economy, it is imperative that sustainable construction practices replace the traditional practices and technologies that were used in the past.

4) Renewable resources role

Energy is the golden thread that binds social justice, economic progress, and a climate conducive to global prosperity. Energy is necessary for development, and sustainable development cannot occur without sustainable energy [5]. Its ability to be sustained by the environment indicates that it poses no threat to it.

This implies that we must begin with a positive energy balance. Since we are net energy consumers, the expense of producing renewable energy during its lifetime exceeds its production. This makes it unsustainable. But it also has a material component. We must not turn a blind eye to the fact that anything mined kills entire ecosystems. The four sources of sustainable electricity that are typically considered are biomass, hydro, solar, and wind.

5) Relationship of dynamic rotating building with sustainability

Three significant developments are revealed by dynamic architecture: morphing shapes, mass manufacture of components, and independent renewable energy generation. Dynamic architecture makes modern architecture more environmentally friendly and efficient by designing buildings that move with the wind and the sun.

Buildings with dynamic architecture constantly change shape. Two of the most notable aspects of Dynamic Architecture structures are their development process and their autonomous energy production capability. Prefabricated units that are custom-made in a workshop to meet very high quality standards are used to construct these buildings quickly, affordably, and with fewer workers on the job site.

The utilization of renewable energy sources, an energy-efficient system, user dependability, and sustainable building materials are the fundamental components of sustainability. Building his first skyscraper, the grandiose construction plans by Italian architect David Fisher are the largest since the Pyramid of Khufu.

Nearly the whole framework of the \$700 million self-powered building is prefabricated, and the 80-story skyscraper rotates in response to voice commands. A total of 79 wind turbines, one between each story as depicted in Figure 5, and photovoltaic solar cells provide power for the up to three-hour rotation, which means you're not always in the Dynamic Tower.



Figure 4. Structural view of dynamic tower



The only part of the tower built on site will be the skinny center core. It is strong enough to hold the floors in place, and will contain the building's elevators, which transport people and cars right to their door. Each floor will be made piece by piece in a factory in Italy—a throwback to Fisher's previous life in prefabricated bathroom design—and placed onto the core using a lift system.



Figure 5: Concept of dynamic tower

With this method, each story is completed in about six days. By comparison, traditional ground-up methods can take six weeks per floor. The speed of wind in Dubai is 16mt/sec. considering per year 2300 hr of 16mt/sec of wind in Dubai, we expect to have 460000Kwh of energy produced by one turbine in one year, as each family consumes 24000Kwh per year, therefore one turbine should supply energy for 19 apartments.

The practical advantages are limited, at best.

A rotating residential building each floor rotates separately, under the control of its occupant. Can allow apartments to be positioned depending on mood, weather, or daylight - for instance, one might want to have the bedroom facing south to capture as much sun as possible in winter, but faced north in summer so you can get a bit more sleep in the morning.

The practical drawbacks are many, including the maintenance requirements, potential unsuitability of a round floor plan to an irregular site, loss of usable space for both the equipment and the spaces where people can transit between the fixed and moving parts of the floor, risk of people being injured or killed if caught in the machinery, and the need to accommodate functions with plumbing, like kitchens and bathrooms, in the core, even if you might want a view from those rooms. Fire protection and electrical services may be an additional headache as well.

The intangible advantage is that revolving structures are rare, so there is some tourist appeal to the revolving restaurants, and a certain cachet to living in one of the few revolving apartments in the world. The key benefits to rotating architecture are they are able to generate kinetic energy as well as ensure maximum sun exposure for solar power. Implications - Some of the featured architecture shows off large buildings while others are environmentally friendly homes.



Spinning Houses Considered Next Global Design Wave



Figure 5. spinning solar powered house in german

It is becoming more and more of an architectural trend to build houses that can rotate and is now being considered to be a new housing luxury. The Dubai Dynamic Architecture towers are the first of many new designs to be proposed for some of the world's most forward-thinking building plans. Companies in Nevada, Brazil and California are simultaneously beginning to develop their own method of creating buildings that will be able to rotate 360 degrees independently. Plans are also being proposed in Canada, Japan, Portugal, and throughout the United States.

Trend Themes

1. **Rotating Housing** - The increasing trend of building rotating houses presents an opportunity for sustainable and customizable housing solutions.
2. **Dynamic Architecture** - Developing dynamic architecture designs that introduce eco-friendly technologies and self-sustainable systems can revolutionize the way we live.
3. **Luxury Housing** - With rotating houses becoming a new luxury housing trend, there is an opportunity for businesses to capitalize on providing high-end customizable solutions for affluent consumers.

Industry Implications

1. **Construction** - Incorporating rotating elements into building designs can provide new opportunities for construction companies to innovate and offer unique products/services.
2. **Real Estate** - Revolutionary rotating houses can introduce a new standard of luxury living, presenting opportunities for the real estate industry to capitalize on this trend and provide unique offerings.
3. **Architecture** - The trend of rotating houses presents an opportunity for architects to explore new design possibilities, especially when it comes to integrating self-sustainable systems in buildings.

III. CONCLUSION

Currently the concept of rotating building is still developing and it is widely used for restaurants. People will come, eat and enjoy the sightseeing. But engineers always desire to extend their imaginations from their previous generations. It is a kind of thirst to make something new, creative structures. We hope to see many more unique shaped (Rotating Skyscraper) structures in future days for the betterment of our stays rather than commercial use. We should also maintain our buildings and keep structures beautiful to live with peace and calm.

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