PROJECTS

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MAGAZINE

Your latest construction news

Global smart building deployments to see growth of over 150% by 2026

Globally, the number of buildings deploying smart building technologies will reach 115 million in 2026, up from 45 million in 2022. This is according to a new study from Juniper Research which says that this growth of over 150% reflects increasing demand for energy efficiency from businesses and residents alike, as energy costs spike.

A smart building as a building that uses connectivity to enable economical use of resources, while creating a safe and comfortable environment for the occupants.

The new research, Smart buildings: Key opportunities, competitor leaderboard & market forecasts 2022-2026, found that by enabling buildings to monitor and automate common functions, significant efficiency gains can be made, while improving the environment for workers and residents. The report recommends that vendors focus on building analytics platforms for the most value to be driven from deployments.

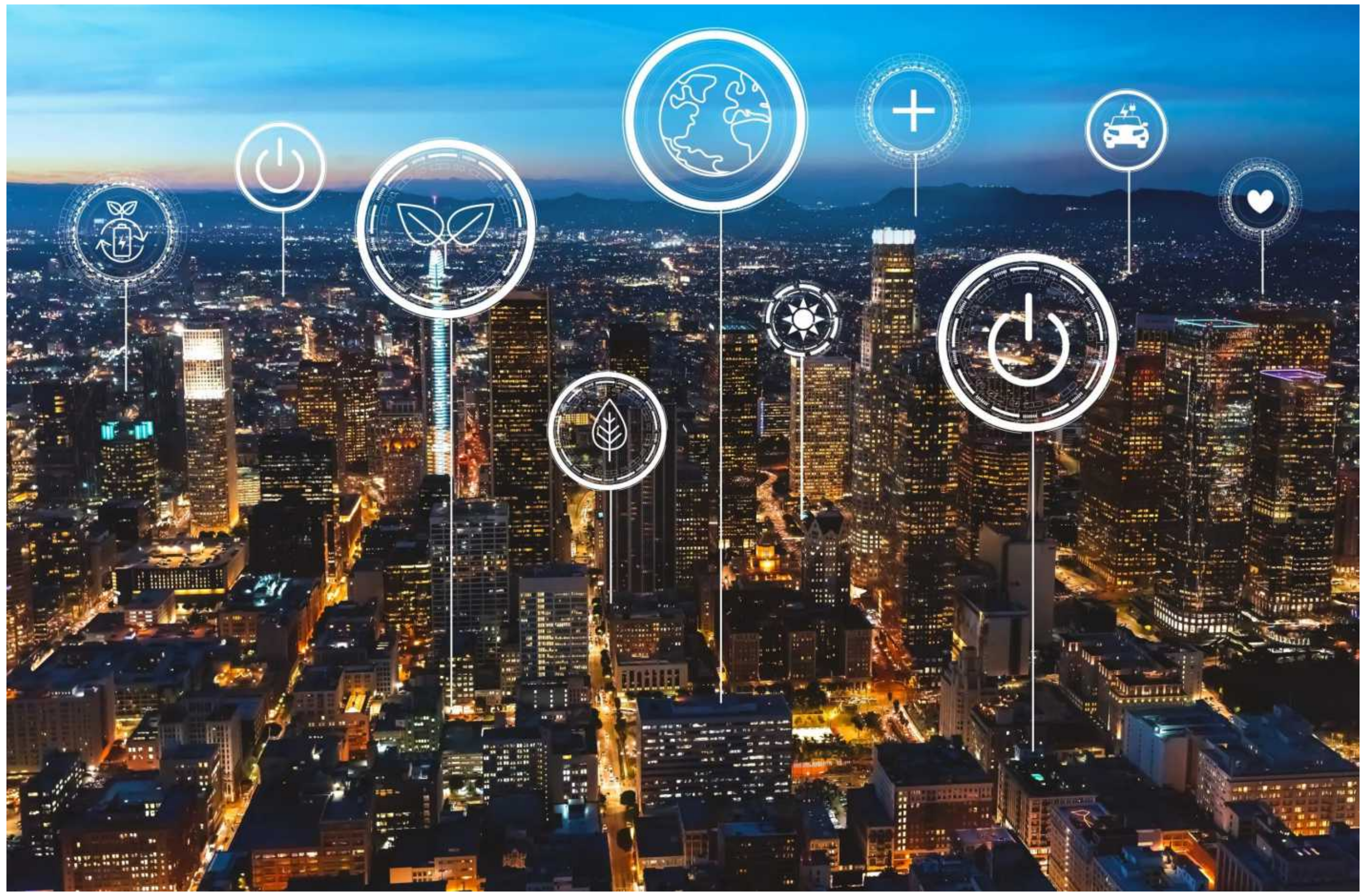
Non-residential smart buildings driving spend

The research found that non-residential smart buildings will account for 90% of smart building spend globally in 2026, at a similar level to 2022. This dominance is due to the larger economies of scale in commercial premises driving this spend, as well as the commercial focus of most smart building technologies.

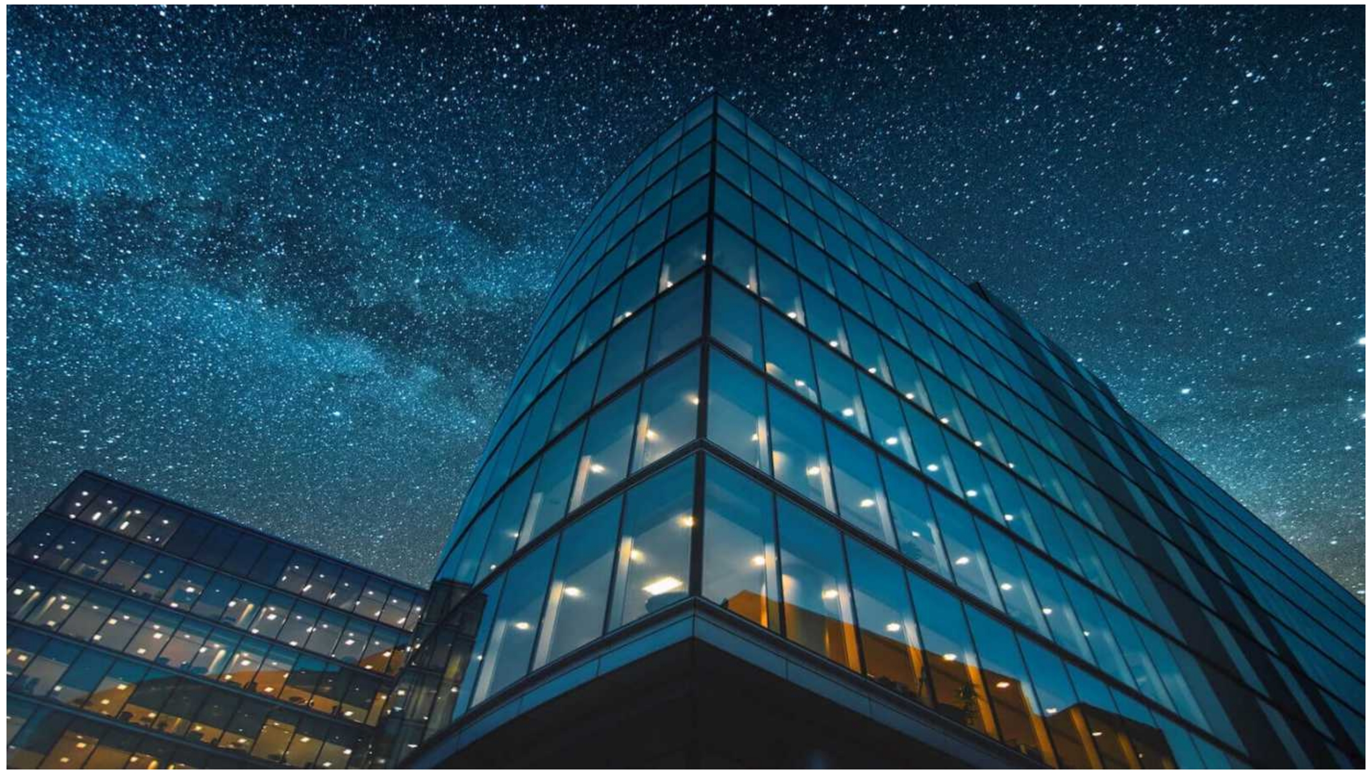
Research co-author Dawnetta Grant explains: "Smart building platform vendors will understandably focus on non-residential use cases as these provide a stronger return on investment, but they should not neglect the importance of residential deployments as environmental concerns intensify."

Smart building sensor shipments to accelerate quickly

The research found that the global shipments of



sensors used in smart buildings will exceed 1 billion annually in 2026 from 360 million in 2022, representing a growth of 204%. Sensors, when combined with intelligent management platforms, will allow smart buildings to adapt to conditions, matching elements such as lighting, heating and ventilation to live requirements. The report recommends that smart building vendors partner with AI vendors to maximise the benefits of automation, such as reduced energy costs and improved working environments.



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KENYA OFFICE

Tel: +254 70 155 2963 P.O.Box 178-20114, Kabazi, Nakuru, Kenya.

Email: info@projectsmagazine.co.ke **Website:** www.projectsmagazine.co.ke

Contributions

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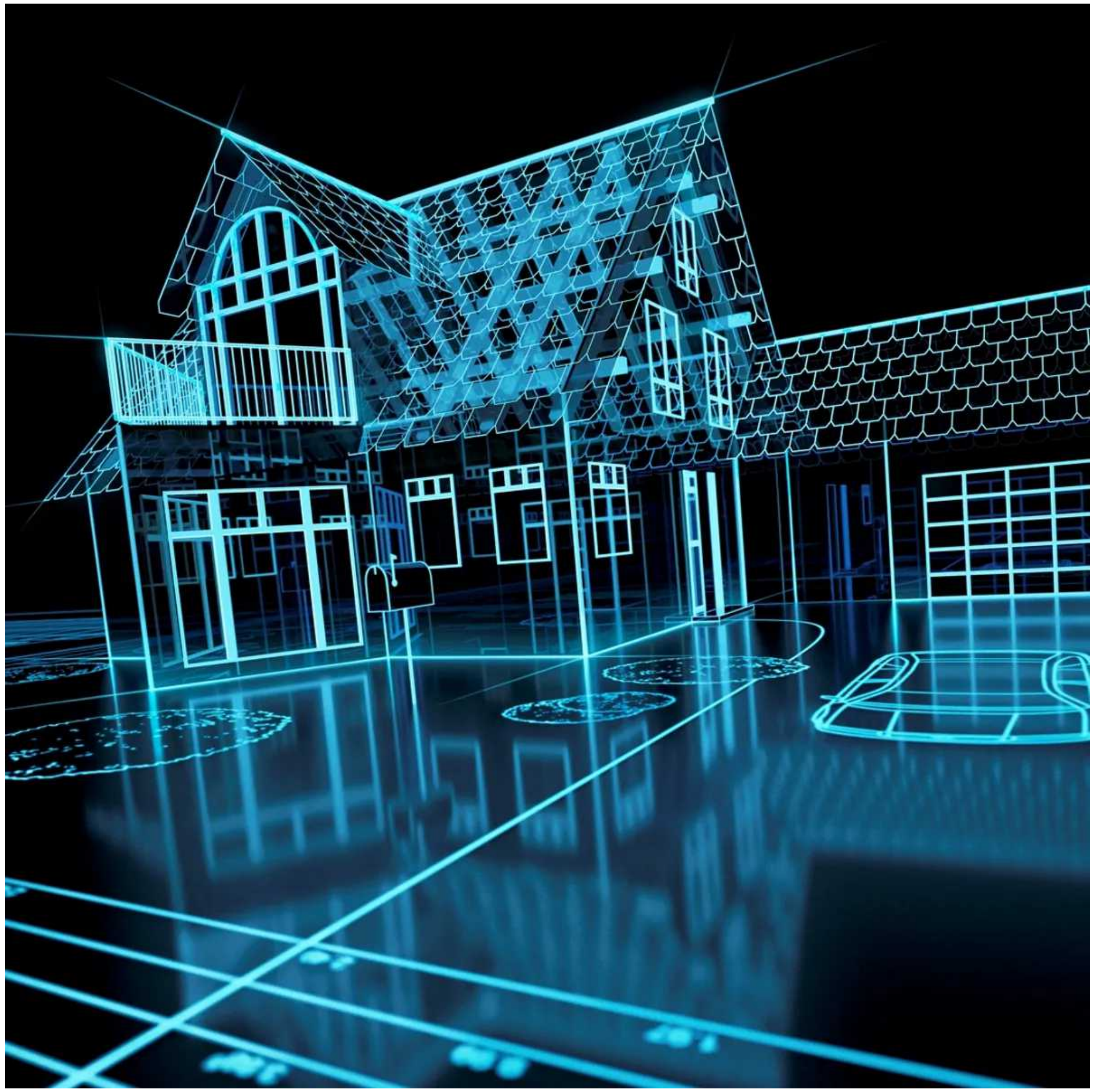
Embracing the era of smart, sustainable, and slick buildings



Globally, there is a significant drive to achieve a net-zero carbon footprint and make buildings more sustainable and energy efficient. But this extends beyond the environment and must incorporate the health and wellbeing of people as well. Going the sustainable route certainly bodes significant long-term benefits for landlords, owners, and tenants, including but not limited to savings on building costs, increased employee productivity, and fewer people having to take sick leave.

From railway stations to office blocks, a worldwide tipping point is approaching between those countries actively embracing centralised, smart cities and those who are falling behind. But more than the technology impact that smart cities will have, they are

instrumental in developing the communities surrounding them. After all, it takes a broad spectrum of services to make smart cities operate. This requires a mix of health and wellbeing, ease of mobility, access to restaurants and supermarkets, and other services.

Building designs are also becoming slicker. There is a focus on using less material and going modular. Think of this as akin to building with Lego. Once its served its purpose, a building can easily be dismantled and shaped into something else. For instance, if the Cape Town Stadium was designed on this basis, the area could now have been used for other functions such as residential, shopping, or even schools.

Adding impetus to this is the need for digital adoption to happen. While South Africa is still behind in certain aspects, things must change for the country to become future-ready. Achieving net-zero and embracing smart will be critical elements in this regard. Yes, budget will always be a challenge. But government and the private sector must look at the long-term potential as opposed to getting a short-term return on investment. Making things more efficient must become a priority. And being sustainable and smart become integral to enable this.

Evolving engineering practice

In the past, engineers and architects had full responsibility and control over the projects they worked on. But as these projects have become more complex and the futuristic design concepts pushed the boundaries of what is possible, engineers and architects with different expertise started collaborating across different geographic locations. This has seen the adoption of digitally driven collaborative tools.

Today, engineers and architects can work in virtual environments, reviewing and signing off designs and construction remotely. Engineering companies that have been in the forefront of adopting these new practices have seen improved results while also reducing their overhead costs, improving worker safety, and even allowing for a better work-life balance.

Design with a difference

Artificial intelligence (AI) continues to grow and become more sophisticated in all industries. AI is used in engineering software for generative design, material selection, and robotic process automation. AI generally adopts machine learning. This plays to the strengths of machines which are better and faster than humans in coming up with hundreds of solutions to a problem, including informing the most efficient solution in a shorter space of time.

However, machines can only take instructions from us. Therefore, the solutions and accuracy provided by the software are only as good as the information we input.

Generative design has also become increasingly popular. This is an iterative design process in which an engineer or designer enters certain constraints to a problem (size, weight, strength, etc.), and requests the computer to provide options. AI is then applied to materials selection, code compliance, and even any other contributing factor related to the problem. Additionally, robotic process automation software enables bots to automate administrative tasks, such as raising invoices, verifying change orders, or managing bills of quantities.

For most applications, AI is already being built into the software, but engineering and architectural leaders will need to be sure they have people who can train and maintain the underlying models, so it is important to understand how specifically AI is being applied.

Codefying the process

As any engineer or architect knows, design is an iterative process despite the benefits that AI can bring. As the technology evolves, so do the core skills required and the engineering language used. Traditionally, a graduate might have needed maths and physics as background to complete their degree. But in a modern world, this must be enhanced by skills in computer programming and digital workflows.

Take visual programming as an example. Platforms such as Grasshopper offer a visual programming interface that allows the programming logic to be readily seen, understood, and implemented. Flowing from here is parametric design. This centres on automated through scripts that can identify the parameters within a design. By assigning those parameters, engineers can explore multiple options either by automation or manually.

Furthermore, once the parametric model is created using a visual programming platform, engineers can iterate options in seconds and the information can be shared visually with clients.

Sustainable priorities

Beyond software technology, structural engineering can utilise techniques to ensure buildings are designed and constructed efficiently and sustainably. These engineers are aggressively seeking low-carbon building materials to reduce the carbon footprint of the build environment. Advances in concrete technology are providing solutions in response to these goals, helping the construction sector work towards its target of net-zero carbon emissions.

In this area, embodied carbon has become a significant factor in minimising the detrimental environmental impact of structures. It can be defined as the carbon footprint of a building or infrastructure project before it becomes operational. This is primarily associated with the different life cycle stages: material extraction, manufacturing and production, construction, damage and repair during service life, and end-of-life considerations.

Being resilient

When it comes to the sustainability of buildings, resilient and redundant systems become a massive influencing factor. Climate change makes severe weather events much more likely, which increases the risk of flooding and wind damage. It is the responsibility of engineers to design with this in mind and future-proof buildings for any potential future events.

Aiding in this regard is concepts such as advanced model-based deliverables, integration of multiple services with core structural engineering, and using new materials and high-performance fabric.

Resilience also sees interest increase in how smart buildings can help in reducing the carbon footprint of people. Global energy utilisation concerns, as well as local ones given the precarious South African electricity grid, are major factors driving the need for smart building growth.

Japanese Firm to Spend Sh6bn on 40MW Kitui Solar Project

A solar park. The use of solar energy can save money on household power bills. PHOTO | FILE
Japan solar power systems manufacturer Looop Inc. is finalising plans to build a 40-megawatt solar plant in Kitui County, about 170 kilometres southeast of Nairobi, as the company seeks to grow its renewable energy footprint in Africa.

This follows the signing of an agreement with governor Charity Ngilu's administration that will see the Tokyo-based company begin production in September next year.

According to the agreement, Looop will develop and implement the business plan, while the county government will provide the land onto which the facility will be set up.

The proposed Kitui solar plant, which is awaiting regulatory approval, arose from joint studies that Looop piloted with the Jomo Kenyatta University of Agriculture and Technology (JKUAT).

At the onset, the Kitui solar plant is expected to produce 10MW before hitting full capacity in 2021. The electricity will be sold to Kenya Power under the country's feed-in tariff system for 20 years.

The government currently offers a tariff rate of Sh12/kWh for solar projects ranging from 10-100 MW in size and Sh10/kWh for 0.5 – 10 MW arrays.

The National Environment Management Authority (Nema), which last month invited the public to comment on the project, said the "solar PV power plant will contribute to reduction in the use of fossil fuels resulting in lower greenhouse gas emissions and alleviation of global warming."

Japan solar project

Looop said in an earlier statement that the project will be the first solar array to be developed by a Japanese company on the continent outside of South Africa.

The project will further raise the profile of Japan as a key developer of renewable energy ventures in Kenya. Currently, Japanese companies such as Mitsubishi, Toyota Tsusho and Toshiba are the top makers of Kenya's geothermal power plants.

Mitsubishi, for example, is constructing a 158MW Olkaria V steam power plant in Naivasha at a cost of Sh35 billion. The plant is scheduled for completion mid-next year.

Toyota Tsusho, in partnership with Korean firm Hyundai, built 280MW geothermal power plants in Olkaria for KenGen – which was fed to the national grid in the second half of 2014.

58MW Olkaria V steam power plant in Naivasha

Here are the world's top 5 smart cities for 2022

JUNIPER® RESEARCH

The ranking of 50 world cities is based on an evaluation of many different aspects of smart cities, covering transportation and infrastructure, energy and lighting, city management and technology, and urban connectivity.

The research particularly lauds Shanghai's Citizen Cloud as a one-stop point for over 1,000 different services for city residents. Thanks to its rapid deployment of data management platforms, efficient, digitised utility management and public services have become common in many cities across Asia, allowing them to climb Juniper Research's rankings.

"Many cities have deployed technology and data to help local authorities reduce environmental impact and energy usage," remarked research co-author Mike Bainbridge. "The top cities in our recent ranking are finding innovative ways to leverage that technology to deliver observable benefits for their citizens as well."

The top 5 smart cities are:

- Shanghai
- Shanghai has been ranked the world's top smart city for 2022 following an extensive study carried out by Juniper Research.

- Seoul

- Barcelona

- Beijing

- New York

The $70bn smart city opportunity
In addition to these rankings, the research found that smart city initiatives will generate almost $70bn in spend annually by 2026, up from $35 bn in 2021. Much of this will focus on

smart city

smart grid initiatives, which will save over 1,000TWh of electricity in 2026, equivalent to more than five years of energy consumption by Greater London at present levels.

Many areas of smart city development are still in their early stages, particularly outside the leading cities, so initial rollouts still make up much of the market. Juniper Research notes that this means savings made through smart city technologies will remain high.

"We expect energy savings alone to reach $96bn in 2026, making their deployment highly cost-effective in most instances," say the organisation.

Turkish Firm to Build Sh90bn Factories in Naivasha

Turkish Industry Holdings, the company behind the proposed $760 million (Sh90 billion) Naivasha Special Economic Zone (SEZ) in Nakuru County, has begun construction of six factories that will largely produce high-end construction materials for export.

Dubbed the Turkish Industrial Complex, the Turkish Ceramic, Granite and Tiles SEZ, whose ground-breaking event was held on Tuesday, will specialise in the manufacture and sale of construction, forestry, furniture, and cleaning products.

These include medium-density fibreboard (MDF) – a raw material for furniture industries, ceramic and granite tiles, steel, cement, aluminium profile, sanitary towels, tissue paper, and towel napkins, among other products.

According to the company's board chairman Mehmet Coskun, the MDF factory will specialise in high-end furniture for both local and international markets.

The Turkish Industrial Complex will also feature a cement factory.

"The (MDF and cement plants) will be producing 30% of products for the local market and 70% for export to regional and international markets like Europe and the US," Mr Coskun said.

Construction of the Turkish Ceramic, Granite and Tiles SEZ, which sits on 100 acres, will be completed in 30 months. The SEZ is projected to inject Sh60bn to the economy.

Turkish invesmentin Naivasha to create 2,900 local jobs

"We are going to push out of Naivasha for export a minimum of 500 containers of different products per day through the port of Mombasa," Mr Coskun added.

Turkish Industry Holdings plans to employ 2,900 Kenyans and 350 Turks and German at its six factories. This will help Kenyan contractors to acquire Turkish engineering technology and materials which have been ranked among the best in the world.

On Wednesday, the company appointed Mwaniki Munuhe, 36, to the position of the Vice President of the Turkish Ceramic, Granite and Tiles SEZ.

The Kenyan executive is expected to lead the African operations of the Turkish firm as it seeks to set up the biggest construction materials factory in the region.

"The [company] has the pleasure to announce [the appointment of] a Kenyan – Mr Mwaniki

Project," Turkish Industry Holdings Vice President Abdulhakim Alici said on Wednesday.

Turkish Industry Holdings had earlier ventured into Ethiopia but stopped operations following long-drawn-out political tensions in the country.

Investors from Turkey are increasingly eyeing investments in the Kenyan construction sector following the 2016 signing of a bilateral agreement between Kenya and Turkey that sought to raise bilateral trade volume to Sh100 billion.

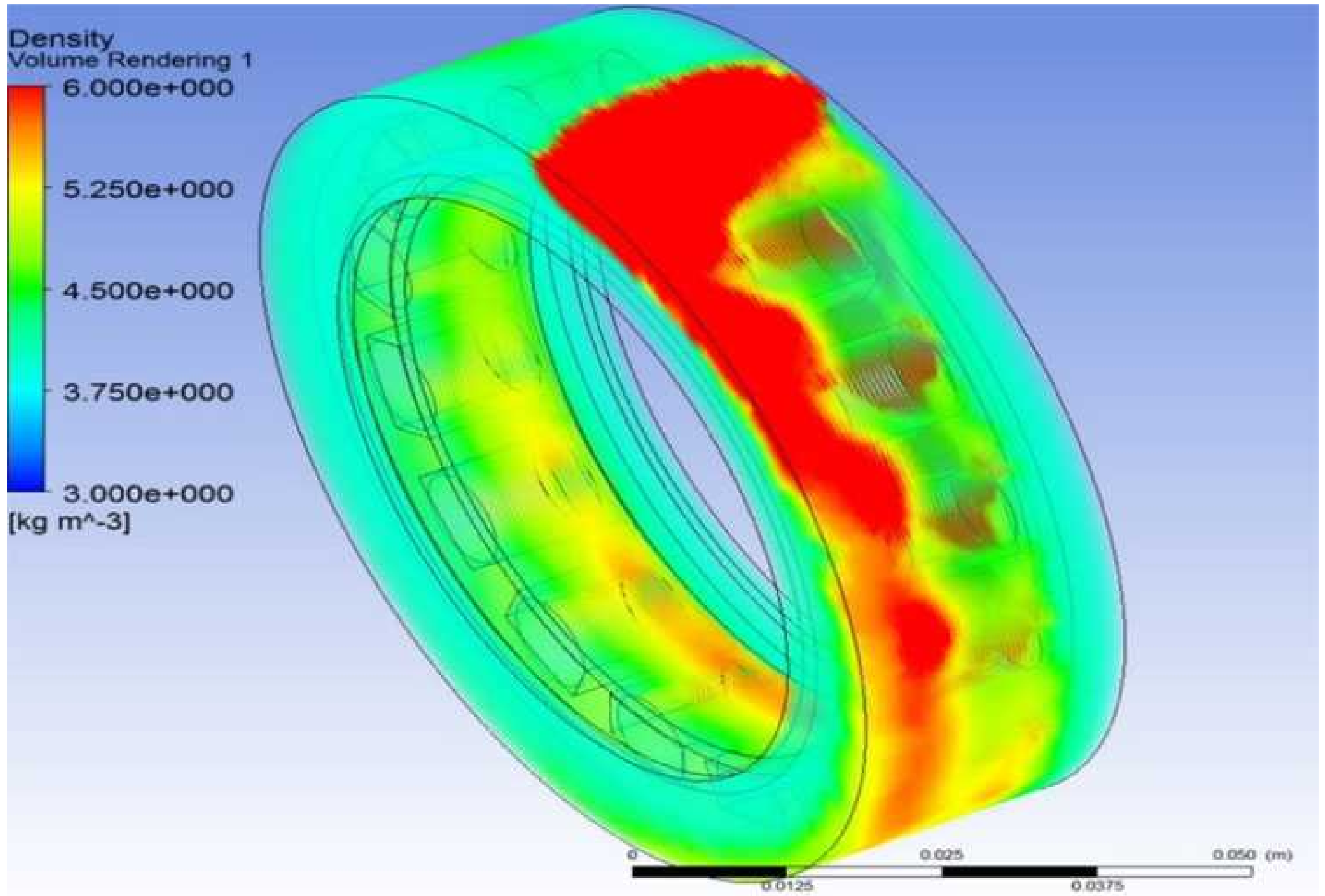
Towards improving the future of rolling bearing manufacturing

In total, more than 100 billion rolling bearings are currently in operation worldwide. Rolling bearings are used in thousands of industrial, automotive, marine and aerospace applications. Statistics demonstrate that from 40% up to 50% of rotating mechanism failures are caused by the bearing failures. Presently, the processes and machines are so sophisticated that the risks of failure or disruption become too high or costly.Samara State Technical University (Samara Polytech) scientistsare developing an approach aimed at radical change of the situation; their approach is based on creation and implementation of digital twins in the design, production and lifecycle management of rolling bearings[1].

A group of researchers led by the head of the Mechanics Department Iakov Klebanov is developing virtual analogues of roller and ball bearings. The analogues consist of advancedmultidisciplinary mathematical models, which represent the dynamics of movement and interaction of bearing parts, the hydrodynamics of the lubricating medium in the bearing cavity, mechanical deformation, stiffness, strength and durability of parts, including the seal, and the bearing as a whole. While creating the bearing models, both original methods and software tools are used as well as universal software packages: CAE ANSYS and other.

"At first sight, a rolling bearing indeed appears to be asimple mechanical component consisting

of a set of rolling elementsrolling between a stationary and rotating parts and separatedby a cage. Interaction between each of these elementsof the bearing also appears to be quite simple and, therefore, simulationof rolling bearing performance should be a straightforwardtask. However, it is the coupling between the simple interactionof bearing elements that makes modeling and simulationof real-time performance of a rolling bearing a difficult task", says Professor Klebanov.



Oil concentration distribution in a roller bearing's cavity

The current result of the project is the advanced design of 15 ball and roller bearings implemented into the production at the OJSC "EPK Samara", which is the industrial partner of Samara State Technical University in this project. Besides increasing the reliability and durability of bearings, the experience of this implementation significantly reduces the time and cost of their design and manufacture.

Beyond computer-aided design and engineering, digital twins offer engineers virtual tools for managing technology, assets and resources while improving performance.The research will focus on formation of a multi-level matrix of targets and resource constraints: time, financial, technological, production, environmental and others, designed to agree on the target characteristics of both the bearing as a whole and its parts. The target matrix should provide the ability not only to track the mutual influence of the components, but also to make the necessary changes and clarificationspromptly.

The project work plan includes also the following stages:

development of highly adequate virtual analogues of stands for testing roller and ball bearings and their parts for durability, maximum rotation speed, allowable temperatures, noise level, accuracy and other tests;
development of digital models that solve the problem of determining the material embodiment of the electronic model of the bearing by generating control programs for computer-controlled equipment and technology and formation of digital twins of technological processes, combining computer-aided manufacturing models, accompanying virtual tests and stands;
combining digital twins of rolling bearings and digital twins of technological processes of their manufacture within a single digital model – a "smart" digital twin of the first level;
development of procedures for making changes in the "smart" digital twin based on the results of physical tests and operational data, increasing the level of its adequacy and allowing in the future to simulate various situations and operating modes with its help: assessing the level of possible damage andits accumulation, evaluating the residual life, planning and managing the maintenance and repairs of rolling bearings;
creation of a unified information and computing environment based on modern information technologies, combining various digital models into a common environment for the formation of digital twins.
The use of the technology of digital twins of rolling bearings will make it possible at the stage of designing to determine the optimal design solutions, to providea control over the quality of design solutions and to assess the impact of real production capabilities, the cost of mastering production and the production itselfon the implementation of the design idea.

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WE CREATE THE BRICK

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