



HSK78G
2MW Lean Burn
Gas Generator
44.2% Electrical Efficiency



Energy Solutions (Pvt.) Limited

customer@eslpc.com | www.eslpc.com | 111-222-151 (375)



UNIVERSAL CABLES

THE POWERLINE OF PAKISTAN

021-111-786-825 www.ucil.com.pk

Will We Ever Be Able to Prevent Gas Cylinder Explosions?

A growing number of LPG cylinder explosions across Pakistan has raised serious safety concerns, with estimates suggesting that 300 to 500 fire and blast incidents occur annually.

The frequency of such incidents increases significantly during the winter months, when gas consumption rises sharply and households turn to LPG as an alternative fuel.

Experts attribute the surge in incidents to a combination of factors, including illegal decanting practices, substandard or expired cylinders, and the widespread use of faulty regulators and pipes. The situation is particularly alarming in densely populated urban centers such as Karachi, which records the highest number of incidents, followed by Lahore and Peshawar.

According to safety analysts, the root causes go beyond usage patterns. Weak enforcement of safety regulations, the unchecked proliferation of illegal LPG refilling shops, and the availability of low-quality equipment continue to put lives at risk. Many cylinders in circulation do not meet safety standards, while routine inspections remain inadequate.

The seriousness of the issue has now reached Pakistan's legislative forums. A

recent meeting of the Senate Standing Committee on Cabinet Secretariat, chaired by Amir Waliuddin Chishti, expressed grave concern over the rising number of LPG-related incidents and called for stricter regulatory oversight across the supply chain.

The committee revealed a stark mismatch in the sector's regulatory framework. While only 18 cylinder manufacturing companies are officially registered nationwide, a single district reportedly hosts as many as 150 manufacturers, highlighting the scale of unregulated activity. Lawmakers described the situation as a major public safety risk requiring urgent intervention.

During the session, Aimal Wali Khan called for a comprehensive, data-driven assessment of the LPG sector. He demanded detailed records on cylinder production, usage trends, and a consolidated report on explosion incidents over the past decade. Stressing accountability, he questioned the effectiveness of existing laws, stating that legislation alone is not enough without proper implementation.

"Laws are made, but who will implement them and how?" he asked, adding that enforcement remains the weakest link in the system.

The committee also examined the role of the Oil and Gas Regulatory Authority (OGRA), particularly its enforcement powers. Members debated whether the

authority requires additional powers or whether existing mechanisms are simply not being utilized effectively. Concerns were also raised about whether locally manufactured cylinders meet internationally accepted safety standards.

Highlighting structural flaws, Senator Aimal Wali proposed the formation of a joint and empowered oversight body comprising members of the National Assembly, Senate, and OGRA officials. He emphasized that the issue extends beyond regulatory bodies and requires direct government intervention.

Meanwhile, Saadia Abbasi strongly criticized delays in both legislative and executive action. She pointed to inconsistencies in the market, noting that cylinder prices range widely from Rs5,000 to Rs15,000, raising questions about quality and standardization. She also expressed concern over the unchecked sale of illegal cylinders and demanded detailed data on enforcement actions, including the number of FIRs registered, illegal factories shut down, and shops sealed.

"Legislation is the responsibility of the government, and delay is unacceptable," she said, urging authorities to move beyond discussions and deliver tangible results.

The committee also

Contd on page 2



BEST ELECTRIC PANELS (PVT) LTD

Made to Control!

BEST GROUP SWITCHGEAR, CONTROL, PROTECTION & MEASURING SYSTEM

CRAFTING TECHNOLOGY SOLUTIONS WITH LONG TERM SUSTAINABILITY AT THE CORE.



Best Street,
14 Commercial Area,
Latifabad, Unit No. 2,
Hyderabad, Sindh,
Pakistan.

P : +92 22 340 7740
P : +92 22 340 7741
E : info@bestelectricpanels.com
W : www.bestelectricpanels.com
Facebook : facebook.com/bestelectricpanels



JUBILEE CORPORATION

SWITCHGEAR | AUTOMATION | INSTRUMENTATION | CONTROLS

Authorized Distributor of more than 35 World Renowned Brands

www.jubileecorporation.com
jubilee.corp@jubileecorporation.com



Low Voltage Switchgear



Power Distribution



Energy Management and Automation



Lightning Protection & Earthing



Pneumatics



Power Quality



Motion Division



Instrumentation & Controls

TECHNOLOGY DRIVEN QUALITY SERVICE



LV TYPE TESTED ABB SWITCHGEAR

System Pro E Power
• Fully type tested for Conformance to IEC-61439 1 & 2.
• Rated Current: up to 6300A.
• Form of Segregation: Form-1 to Form-4b.

Manufactured under license by ABB.



BUSBAR TRUNKING SYSTEM WAVEPRO — ABB

Certified by KEMA-KEUR to latest standard IEC 61439-6 and IEC 60331-1 for fire proofing.



ABB MV TYPE TESTED SWITCHGEAR
Manufactured under license by ABB.

IEEEEP Holds 41st Students Seminar at Iqra University

Karachi: The IEEEEP organized its 41st Students Seminar at the main campus of Iqra University,

The inaugural session featured Engr. Haroon Rasheed, a former IBM chief, as the chief guest. He was joined by Gayasuddin, Director of Nestek, among other distinguished partici-

Quality Analyzer
• A Smart Glove for Sign Language Translation Enabled by Machine Learning Algorithms
• SehatSync: An Edge-Compute AI Triage Kiosk

System and Cybersecurity
• Automated Quality Control using Computer Vision and Delta Robot
• Multi-Role Surveillance and Payload Dropping UAV Drone



bringing together a large number of students, faculty members, professional

pants. The event included technical sessions organized into three parallel tracks. In total, 10 research papers

with Integrated Biomedical Sensing for Resource-Constrained Healthcare Environments
• Intelligent Heart Mur-

• Audivie: An Automated AI-Powered Voice Interviewer
The seminar provided a valuable platform for stu-



engineers, and IEEEEP leadership.

The seminar, themed "Empowering Future Engineers," focused on innovation, research, and emerging technologies shaping the next generation of engineers.

were presented by students, showcasing diverse and innovative ideas.

Among the key presentations were:
• Student Academic Performance Prediction Using Data Warehousing and Data Mining Techniques
• IoT-based Smart Power

mur Detection System using Phonocardiogram Signals
In another session, students presented projects including:

• AI-Powered Real-Time Pakistan Sign Language Interpreter on a Vision Edge Node
• Battery Management

dents to present their research, exchange ideas, and engage with industry professionals, reflecting IEEEEP's continued commitment to fostering innovation and technical excellence among future engineers. - ER

Lucky Subsidiary Enters Partnership with GAC Group

Lucky Cement Limited has announced that its subsidiary, Lucky Motor Corporation Limited (LMC), has entered into an exclusive partnership with GAC Group, a

with parts and accessories in Pakistan. The company also has an agreement with Samsung Gulf Electronics for the assembly of Samsung-branded mobile devices in the country.

With the addition of GAC to its automotive portfolio, LMC aims to further strengthen and diversify its



Fortune 500 company ranked among the top performers in the JD Power China Quality Survey.

According to a disclosure submitted to the Pakistan Stock Exchange, the strategic alliance marks a significant step in LMC's efforts to bring advanced automotive technology and innovative mobility solutions to the Pakistani market.

LMC is currently engaged in the manufacturing, assembly, marketing, distribution, and sale of KIA and Peugeot vehicles, along

product lineup, reinforcing its commitment to offering high-quality, reliable, and globally recognized vehicles to consumers in Pakistan.

As the parent company, Lucky Cement continues to pursue a diversified growth strategy across multiple sectors, including cement, automobiles, mobile phone assembly, chemicals and agricultural sciences, pharmaceuticals, energy, as well as copper and gold mining, with a focus on enhancing earnings quality and maximizing shareholder value. - ER News Desk

Will We Ever Be Able to Prevent Gas Cylinder Explosions?

Contd from page 1

questioned the role of law enforcement agencies in curbing illegal practices and asked when concrete steps would be taken to address the issue.

With LPG usage expected to remain high, particularly in areas facing natural gas shortages, experts warn that without immediate and effective regulatory measures, the

risk of accidents will continue to grow. They stress the need for stricter quality control, public awareness campaigns, and a crackdown on illegal refilling operations.

As policymakers deliberate on reforms, the challenge remains clear: ensuring that safety standards are not only defined but effectively enforced to prevent further loss of life and property. - Engineering Review Report

Engineering Bazar

Engineering Review

THERMAX Industrial Heating

Infrared Burner and Air Mixing Burners for Natural Gas and LPG

Burner
Gas, Diesel or Dual Fuel Maximum efficiency upto. 5000KW

Furnace
Gas Fired / Electric upto 1700°C
Controlled atmosphere / Vacuum Tube Furnace / Ceramic Kilns

PAPERLESS RECORDER
Features:
FI to 34 channel recordings. F Multi input Thermocouple / RTD / DC Voltage / Current.
F Monochromatic / Colour / LCD Display. F RS-232/485 communication / Ethernet.

LPG Vaporizer

THERMOCRAFT
The super store for instruments and materials of boilers and furnaces
Phone: (021) 3272 0757, Fax: (021) 3277 1108;
E-Mail: thermcraft@gmail.com Website: www.thermcraft.com.pk

Urethane Systems & Products Corporation
(A Member of the Product Group of Companies)
OUR RIGID POLYURETHANE FOAMS
HOT & COLD INSULATION APPLICATIONS
are widely used in Building and Constructions because of its High Strength & Energy Saving, Void-free, Heat & Sound insulation, Water & Moisture resistance.

PLEASE CONTACT US FOR:
SPRAY FOAM applications over walls & roofs.
SANDWICHED PANELS for pre-fabricated structures
PIPE INSTALLATIONS & HVAC DUCTINGS
www.theproductgroup.com/usp
www.facebook.com/uspcep
0300- 2374459 , 0333-2480659

C&M AUTOMATION (PVT) LTD.
SIEMENS REGIONAL DESIGNATED SYSTEM INTEGRATOR
C-188, Sector 31-D, P&T Society, Korangi Industrial Area, Karachi-74900, Pakistan
Tel: +92-21-35070751, 36018008, Mob: 0301-8241554
E-mail: crmautomation@pakpc.com Web: www.pakpc.com

SERVICES
- Energy Management
- PLC Troubleshooting & Repair
- Automation Panel Building
- Instrument Commissioning & Integration
- Data-Logging & Monitoring Systems
- Plant Commissioning Support
- Migration from Obsolete Control

PRODUCTS
- PLC's, PAC's and HMI's
- SCADA Software
- Remote I/O and Data Acquisition
- Isolated Transmitters/Signal Converter
- VFD's, Servo and Motion Control
- Motors and Switchgear
- Industrial Communication Gateways

BABAR BROTHERS & DOORS
METAL ENGINEERING SERVICES

Cell : 0300-2303902
0315-2442290
0333-3327366

Fire Door

Fire Door

Prime Quality Fire Doors • Asperities • Billboards • Monitors • Industries • Hospitals • Airports • Airports

60 & 120 MINUTES FIRE RATING
SINGLE/DOUBLE LEAF
VISION PANEL, PANIC BAR, CLOSER
MS & SS DOORS ARE AVAILABLE ANY SIZE & ANY TIME

E-mail: babarbrothers060@gmail.com web: www.babarbrothers.com.pk

FOOD GRADE
PVC & PUR HOSES

piab

- FREE OF PHTHALATES
- SMOOTH INTERIOR WALLS
- PROVIDE FOR OPTIMAL FLOW
- THE HOSE IS SUITABLE
FOR ALL TYPES OF AIR
AND FUMES AND TO
TRANSPORT DUST AND POWDER

For Details Please Contact:

NETWORK TRADE MARKETING

Ph: +92-21-36707233 - 36608964; Cell: +92 300 8299153
E-mail: ntmplab@gmail.com Website: www.ntmpk.com

FORTNIGHTLY
**ENGINEERING
REVIEW**

GOLDEN JUBILEE
5
ENGINEERING
REVIEW
1975 - 2025

The voice of engineer

Years of Committed Service

Pipes & Fittings
uPVC, PVC, PE, PPR

eive

ISO 9001: 2015 CERTIFIED

PELIKAN PIPE INDUSTRIES (PVT) LTD.

Karachi: Ph: 021-32571593, 32581390;
info@pelikanpipes.com.pk

Sazgar Engineering Works Limited Announces Key Appointments, Expansion Plans

Sazgar Engineering Works Limited has announced a series of key management appointments along with major expansion initiatives, according to a notification submitted to the Pakistan Stock Exchange.

The Board of Directors, in its meeting held on March 28, 2026, appointed Saira Asad Hameed as Chairperson of the Company for a three-year term. Mian Asad Hameed has been appointed as Chief Executive Officer for the same tenure, with a monthly remuneration of Rs5.8 million (net of tax), subject to annual increments and additional benefits.

The Board also appointed Saeed Iqbal Khan as

Executive Director and Chief Operating Officer (COO) of the Three Wheelers & Automotive Parts Division, with a monthly remuneration of Rs 3.0 million. Additionally, Mian Muhammad Ali Hameed has been appointed as Executive Director and COO of the Car Division, with a monthly remuneration of Rs 1.6 million. Both appointments are for a period of three years, effective March 28, 2026.

On the operational front, the company announced the completion of its previously approved expansion plan for four-wheeler manufacturing facilities, with an overall out-



Sazgar Engineering Appoints Saira Asad as Chairperson, Mian Asad Hameed as CEO; Announces Expansion Plans

lay of Rs11.5 billion. This includes the construction of a new assembly line, installation of a 5.7MW solar system, and development of warehousing facilities. A portion of the investment has been reallocated towards the installation of a fully automated paint shop.

The Board has further approved a new expansion plan involving the installation of a state-of-the-art, fully automated paint shop along with associated civil works and equipment, at an estimated cost of Rs 22 billion (excluding land cost). The project will be financed through a combination of internal cash generation and bank borrowings. Upon completion, the company's four-wheeler pro-

duction capacity is expected to reach 54,000 units per annum on a single-shift basis.

The company also announced that the first rollout of its CKD model, the TANK-500 Hi4-T 4x4 2.0L Turbo AT PHEV/HEV, is expected by the end of March 2026 on a trial basis.

In addition, the Board approved a budget of Rs4 billion for the acquisition of approximately 900 kanals of land near the existing car plant to support future expansion. The company also plans to purchase a 5-kanal commercial plot at Pine Avenue, Lahore, for around Rs 1.1 billion to establish a showroom, after-sales service facilities, and commercial offices.

The Chief Executive Officer has been authorized to finalize negotiations and complete all legal formalities related to these land acquisitions. - ER Report

GRUPPO ENERGIA POWER QUALITY MANAGEMENT POWER FACTOR CORRECTION & POWER METERING EQUIPMENT

MADE IN ITALY

live with energy...

GEAHF
Active Harmonic Filters, 3 in 1
Wall mounted type, from 30A up to 100A, 230V - 400V, 50/60Hz
Cabinet type, from 70A up to 400A, 230V - 690V, 50/60Hz

GESVG
Static VAR Generators
Wall mounted type, from 20kVAR up to 100kVAR, 230V - 480V, 50/60Hz
Cabinet type, from 40kVAR up to 400kVAR, 230V - 690V, 50/60Hz

3CBAmLV
PFC Capacitor Banks LV
from 5kVAR up to 1500kVAR, 400V - 690V, 50/60Hz
With or without Harmonic reactors

3CBAmMV
PFC Capacitor Banks MV
from 100kVAR up to 5MVAR, 1kV - 15kV, 50/60Hz
With or without Harmonic reactors

RCM-INB, RCM-INP, RCM-INA
PFC Capacitors Three Phase LV
from 1,25kVAR up to 62,5kVAR, 400 - 780V, 50/60Hz
Type Standard, Type Heavy Duty, Type Extra Heavy Duty.

GE-RT3/GE-RTM3
Detuned Harmonic Reactors LV
from 2,5kVAR up to 100kVAR, 400V - 690V, 50/60Hz
P = 5,67% - 210Hz / P = 7% - 189Hz
P = 14% - 134Hz

3TRD
Three Phase Dry Type transformers LV
Type Safety transformers. Rated Power up to 25kVA
Rated Input Voltage 100V - 600V
Rated output Voltage 24V - 600V
Type Isolating transformers. Rated Power up to 40kVA
Rated Input Voltage 100V - 600V
Rated output Voltage 24V - 600V
Type Power transformers. Rated Power from 41kVA up to 1000kVA
Rated Input Voltage up to 1000V
Rated output Voltage up to 1000V

GESBZ
Voltage Stabilizer
from 1kVA up to 3000kVA, 110V - 440V, 50/60Hz

PA007JB
Power Analyzer Tariff Meter & Data Logger
For Single phase & Three phase LV & MV, electric power distribution systems. With large color LCD display.

ERD 6/ERD 12 ERDS 7/ERDS 13
Power Factor controllers LV & MV. Fully Automatic. Type ERDS with LCD graphic display.

GE-VC-3
Load Break Switches LV
from 160A up to 3150A, 415V, 50/60Hz

GRUPPO ENERGIA s.r.l.
Via Cavezzo, 36 - 25045 Castegnato (Bs) - Italy
Phone: +39 030 320 301 - Fax: +39 030 2411 006
Mobile: +39 348 007 6538 / +39 389 619 1385
www.gruppoenergia.com - mail: info@gruppoenergia.com

CHINT | **Next**
CHINT ELECTRIC series

The Next Reliable Choice

Air Circuit Breaker | Moulded Case Circuit Breaker |
Modular Din Rail Product | Motor Control & Protection

IEC
Official Distributor The Imperial Electric Company (Pvt) Ltd.

Karachi 021-34555895 | Lahore 042-36304861-5 | Islamabad 051-2150218
www.iec.com.pk

Advancing Energy, Digital Transformation: Schneider Electric Hosts Future Partnership

Schneider Electric Pakistan hosted Partnership of the Future – Lahore,

bringing together contractors, consultants, distributors, retailers, resellers, home builders, and

strategic partners dedicated to advancing Pakistan's energy and digital transformation. The event showcased

launch reflects Schneider Electric's ongoing commitment to advancing electrification and enhancing user experience in homes and build-



Dr Abdul Sattar Saand nominated to head IEEE Sukkur Subsection

Abdul Sattar Saand has been nominated as Chair of the IEEE Sukkur Subsection following a decision taken at the Executive Committee meeting of the IEEE Karachi Section held on March 6, 2026.

The nomination is aimed at revitalizing the activities of the Sukkur Subsection and expanding the footprint of Institute of Electrical and Electronics Engineers (IEEE) across Upper Sindh.

Speaking after his nomination, Dr Saand expressed gratitude to the leadership of the IEEE Karachi Section, particularly Chairperson Muhammad Shahid Shaikh and Vice-Chair Parkash Lohana, for reposing confidence in him and supporting the vision of strengthening IEEE's regional network.

Dr Saand acknowledged that the subsection currently has limited active membership and minimal ongoing activities but said efforts were underway to revive it with strong institutional backing. He noted that the administration of Quaid-e-Awam University of Engineering, Science and Technology (QUEST) Nawabshah, led by Vice Chancellor Saleem Raza Samo, along with guidance from senior academic Bhawani Shankar, would play a key role in strengthening the subsection.

He said the revitalization plan focuses on expanding membership, launching technical activities and promoting student engagement, particularly



through the Women in Engineering (WIE) initiative. The move aims to encourage greater participation of female engineering students by providing mentorship, networking opportunities and leadership exposure within the global IEEE community.

As part of the roadmap for 2026, the subsection plans to conduct a multi-department membership drive covering disciplines such as electrical engineering, automation and control, computer systems, artificial intelligence, cyber security and biomedical engineering.

The initiative will also seek alignment with the standards of the Higher Education Commission of Pakistan and the Pakistan Engineering Council to strengthen academic engagement and enhance the university's technical profile.

Observers say the nomination could mark a new phase of activity for the IEEE Sukkur Subsection, with plans to transform it into a vibrant technical platform for engineers and students in Upper Sindh within the Asia-Pacific region of IEEE.

ER News Desk

Bijli Ghar

Crafting technology solutions
With long term sustainability at the core.



BEST
BEST ELECTRIC PANELS

Best Street, 14 Commercial Area, Latifabad, Unit No. 2, Hyderabad, Sindh, Pakistan.
Tel: (+92-21) 36909873, 36909874, 36909875 Cell: 0300-2190590
email: info@bestelectricpanels.com | web: http://www.bestelectricpanels.com

the strength of collective action and cross-industry collaboration in accelerating sustainable progress across the country.

The gathering featured the official unveiling of the Vivace E Series, a contemporary wiring devices range engineered to elevate modern living through simplicity, durability, and purposeful design. This

ings.

Aligned with Schneider Electric's ambition to serve as Pakistan as the Energy Technology Partner, the event reinforced a shared vision for enabling smarter, more resilient, and more sustainable communities through trusted technology and a strong ecosystem of collaboration. ■

Engineering Review 5

PROGRESSIVE POWER GENERATORS (PVT) LIMITED
Suite # 403, Anum Estate Building,
Main Shahr-e-Faisal, Karachi-75350

CUMMINS / CAT TEAM
WE DEAL IN NEW & USED GENSET SALES, SPARES, SERVICE IN
POWER GENERATION & INDUSTRIAL EQUIPMENTS

- GENERATORS SALES
- WORKSHOP & LAB
- TOP / MOJAR OVERHAULING
- RADIATORS
- ALTERNATORS
- PORTABLE GENERATOR

Service 24x7

Genuine & OEM Parts Importer

CAT **Perkins** **DRESSER** **VOLVO PENTA** **Denyo**

FOR FURTHER DETAILS & ENQUIRIES CONTACT US ON:
PH: 021-34322307-8, MOBILE: 0345-2681973, 0300-9260047
EMAIL: maqsood.cummins@gmail.com

POWERAGE
TOTAL POWER SOLUTIONS

Powerage UPS, 650VA – 800KVA
www.powerage.co

Complete IT, Power & Industrial Solution

0.9PF

Marketing & Sales Office:
Powerage Electronics
110, 1st Floor, Elahi Centre,
Main Regal, Saddar, Karachi-74400
Ph: 021-32744880 - 32742080 - 35684413
E-mail: info@powerage.co - sale@powerage.co

Deals in:

- Servo stabilizer
- ups 3 phase & single phase
- Line Conditioner
- Isolating Transformer 3/3-1/1
- Dry Batteries 12V-5Ah-200Ah



Karimi Electromech Systems

Plot No: 8/5-2, Street-5, Sector 12-C, North Karachi, Industrial Area, Karachi, Pakistan.
TEL: (+92-21) 36909873, 36909874, 36909875 Cell: 0300-2190590
E-mail: info@karimisystems.com, karimiswitch@yahoo.co.uk | website: www.karimisystems.com

"Life is a gift and it offers us the privilege, an opportunity and responsibility to give something back by becoming more."

Tommy Remette

ENGINEERING REVIEW

AL-MADINA Electric Corporation
www.almadinaelectric.com

Estd. since 1967

Pressure Controls
Pressure Switches
Pressure Transmitters
High Performance
Solenoid Valves for all Purpose
Magnetic Contactor Over Load Relays

Danfoss

Maxthermo & Maxtech

Temperature Controller
Humidity Controller
Thermostat
Thermocouple
Proximity Sensor
Multi Range Timer
Micro Processors
Push Button all sorts

International Standard Available
16 Amp 3/4/5 Pins } IP 44
32 Amp 3/4/5 Pins } IP 44
63 Amp 5 Pins } IP 67
125 Amp 5 Pins } IP 67

YEEDA
Plug & Socket

All KINDS OF ELECTRICAL PRODUCTS FOR CONTROLS, DISTRIBUTION & AUTOMATION
Address: 19-Nishtar (Brandrth) Road, Lahore - 54000 (Pakistan)
Ph: (+92-42) 37641306-37641307, 37662197 Fax: 37634579
Email : almadina786@yahoo.com

0301-8441311

Eid-ul-Fitr Celebrations at Energy Solutions, ESL Renewables

Eid-ul-Fitr was marked with warmth and unity across Energy Solutions (Pvt.) Limited and ESL Renewables (Pvt.) Limited, as teams came together to celebrate the spirit of togetherness that defines the organization. The Head Office hosted a festive Eid get-together and lunch, where

virtually, reinforcing the sense of one unified ESL family. A key highlight of the occasion was the address by the CEO, who shared a message centered on gratitude, faith, and collective growth.

Reflecting on the essence of Eid and the organization's journey, he referenced Surah

two decades. From navigating challenges to achieving sustained growth, he acknowledged that these milestones are a result of collective effort, resilience, and above all, the blessings of Allah. He also highlighted with pride that despite industry challenges, the organization has maintained a notably

been granted the capability to strive, grow, and achieve with purpose.

In addition, the message drawn from Surah At-Talaq (65:2-3), reinforcing the principle that those who adopt taqwa are guided through difficulties, and are provided for from sources beyond their expectations.

This served as a powerful reminder of the values that underpin ESL's journey — conducting business with integrity, reliance on Allah, and a commitment to doing what is right.

The gathering was not only a cel-



colleagues shared moments of joy, reflection, and connection beyond the workplace.

The celebrations extended beyond the Head Office, with regional teams joining

Ibrahim (14:7), reminding everyone of Allah's promise that gratitude leads to increased blessings. He emphasized the importance of shukar—not only for the opportunity to observe the blessed month of Ramadan through fasting and تاداب—but also for the company's journey over the past

low layoff rate, reflecting its people-first approach and strong internal culture.

Further, he referred to Surah Hud (11:88), emphasizing the concept of "taawfeeq" — that true ability and success come only through Allah's will. He expressed gratitude that the organization has

celebration of Eid, but also a reflection of the organization's shared beliefs and culture — one that prioritizes unity, gratitude, and mutual support. As the teams continue to move forward, this spirit of togetherness and faith remains central to ESL's continued growth and success. ■

Mari Energies signs agreements for Mari Gas Field pressure enhancement project

Mari Energies Limited has entered into multiple project agreements with leading fertilizer manufacturers for the development of Pressure Enhancement Facilities (PEF) at the Mari Gas Field in Daharki, Sindh, aimed at sustaining gas supply and supporting domestic urea production.

The agreements have been executed with Fauji Fertilizer Company Limited, Engro Fertilizers Limited, and Fatima Fertilizer Company Limited, which are key consumers of gas from the field.

Mari Energies, the 100% working interest owner and operator of the Mari Gas Field, said the PEF project is a strategic initiative undertaken in collaboration with the fertilizer sector. The project involves debottlenecking of pipeline infrastructure, along with procurement and installation of

compression facilities at various junctions of the gas gathering network, as well as associated operations and maintenance.

The initiative is aimed at maintaining minimum delivery pressure of gas from the Habib Rahi Limestone (HRL) reservoir, with the potential to extend the pro-

duction and contribute to the country's food security by ensuring continued availability of a key agricultural input.

A News Discovery Mari Energies Limited announced a gas and condensate discovery at its exploratory well Shams-1, located in the Mari Development & Production Lease (D&PL) in District Ghotki, Sindh.

According to the company's disclosure, the Shams-1 well was spudded on January 30, 2026, and successfully drilled to a total depth of 3,075 meters. The well targeted the Lower Goru-B sands formation.

During testing, the well flowed at 47.98 million standard cubic feet per day (MMSCFD) of gas along with 64 barrels per day of condensate at a choke size of 64/64 inches. A stabilized wellhead flowing pressure (WHFP) of 2,404 psig was recorded.

MariEnergies, which operates the Mari D&PL with a 100 percent working interest, termed the discovery a positive development that is expected to contribute towards enhancing the country's hydrocarbon reserves. - ER

duction plateau of the field. This is expected to ensure uninterrupted indigenous gas supply to fertilizer plants.

In a separate notice to the Pakistan Stock Exchange, Fatima Fertilizer confirmed its participation in the consortium, stating that the project would help enhance and sustain gas flows to fertilizer units.

Market participants view the development as significant for the fertilizer sector, as it is expected to support stable domestic urea produc-



CHINT | Next series

CHINT ELECTRIC The Next Reliable Choice

Air Circuit Breaker | Moulded Case Circuit Breaker | Modular Din Rail Product | Motor Control & Protection




Authorized Distributor

Ameejee Valleejee & Sons (Pvt.) Ltd.

Head Office (Karachi): Ameejee Chambers, Campbell Street, Karachi-74200. Pakistan.
 Phones: +92-21 32625492-5, Fax: +92-21 32627817 & 32621910
 Lahore Office: +92-42 36676507-9, Islamabad Office: +92-51 2321191-2,
 Email: avsltd@avs.com.pk Web: www.next.chint.com

Where does Pakistan stand in unprecedented surge of AI, emerging technologies?

CEO Rastek Technologies, Engr. Rafiq Ahmed Lakhani, in a conversation with ER, explained how Pakistan can progress in this rapidly evolving world and what immediate steps need to be taken.

By Manzoor Shaikh

Human Resource and Skillset

In Pakistan, we face two to three types of challenges. In today's world, we need to work rapidly—like China does. However, the first major issue is regulatory non-compliance. For example, take any university—they cannot even purchase a 3D printer because of the excessive permissions required. There are so many affidavits needed as if someone is building an atomic bomb. Similarly, drones are freely used at weddings, but they are not available for research purposes. These things are easily available abroad, even in small shops. I had to bring them from outside. These hurdles must be removed.

Secondly, we need to move towards skill-based development. After studying for 5–6 years, the question remains: where will jobs come from? This is a major issue, which is why many people move abroad. Some argue that remittances are beneficial, but in reality, it is a loss for us. People find jobs abroad in fields where they are already skilled because we have not created the right environment here. There is a lack of basic industrial infrastructure, and this issue is not limited to technology alone.

We are working with the government on a program in which the Pakistan Software Export Board is also involved. Under this initiative, we are working on the development of IC chip design. Companies have already been established at NED University of Engineering and Technology by Pakistani professionals, and the results are expected to be positive.

The Thought Process for a Massive Campaign

Yes, the work is happening in Pakistan, but unfortunately, it is slow. Too many protocols delay the process. It needs to be much faster. Today, IC chips are essential for everyone. There is a technological rivalry between China and United States over this domain. A country's sovereignty is increasingly dependent on it, so Pakistan must move quickly in this area.

Public-Private Partnership

This partnership is evolving. Rastek is an innovation company, and we have been working on chip design for the past 20 years. We are distributors of Siemens and others. AI has now become embedded in everything. We continu-



ously train our engineers, but this is an ongoing process that needs to be accelerated.

In India, for example, Tata Group alone has invested around Rs22,000 crore in fabrication—something we cannot even imagine. If we cannot build fabrication plants, we should at least establish design centers. The government is helping by providing design tools, but they are very expensive.

Industry-Academia Collaboration

Collaboration with academia yields results to some extent. We have also carried out projects with institutions like Usman Institute of Technology and Mehran University of Engineering and Technology, including work on fuel-saving devices and bagasse-based solutions. However, the issue again comes back to regulation. For example, everyone has installed solar systems, but now the government is not purchasing energy, raising concerns about

payments to IPPs.

The Role of Professionals

Professionals play their role and push for improvements so that better policies are formed. Institutions like Pakistan Engineering Council and the Pakistan Software Export Board are working in this direction. Along with other fields, work on IC chip development has now started. It is essential, and many organizations are moving in the right direction.

Priority Areas

The government considers IT a priority, but other sectors also need attention. IT alone is not sufficient for the government. While there are no major issues in software and call centers, more focus is needed on design centers. Many graduates are emerging in semiconductors, IC design, and human resource development, and they want to move forward in these areas.

AR, VR, and MR

These technologies are highly significant for training. They are cost-effective and deliver promising results. They allow users to immerse themselves within processes. Whether it is an engine or an IC, everything can be visualized in front of you, providing a broader and clearer understanding. Universities should adopt these technologies, as they are now essential. The era of teaching only through blackboards is over.

However, the level of investment required in universities for these technologies is still insufficient. Universities should introduce short courses and make these technologies accessible to people from all fields. A massive campaign is needed to make them mainstream.

We need to move faster in all critical areas. Public sector universities should take the lead so that the private sector can follow. Investment in both hardware and software is essential. Students may begin with gaming, but they will eventually learn and transition to simulation, which is a vast field. We must accelerate our efforts and develop capabilities locally. Many companies are already working in different domains, but much more needs to be done. ■

EXPERIENCE HIGH EFFICIENCY

With the lowest total cost of ownership (TCO)

LARGEST STOCKS IN PAKISTAN:

- Design, Installation, Testing & commissioning of Turnkey Power Solutions.
- Technical expertise and advisory services for the best available Power solutions.
- Annual maintenance contract available.
- Comprehensive warranty with parts.
- Backup time Minutes to Hours.

UPTO 3MW

IDEAL FOR MODERN DATA CENTER DEMANDS

EX-STOCK AVAILABILITY
SERVICE ENGINEERS TRAINED & CERTIFIED BY ABB

HEAD OFFICE
Jaffer House, 17-Timber Pond, Keamari, Karachi-75620, Pakistan.

BRANCHES
LAHORE | ISLAMABAD | MULTAN | FAISALABAD | QUETTA | HYDERABAD | SUKKUR

SERVICE CENTERS
| RAHIM YAR KHAN | KOHAT | JHELUM | CHITRAL | MARDAN | MIRPUR KASHMIR | D. I. KHAN | GAWADAR |
| PESHAWAR | GILGIT | JACOBABAD | LARKANA | GUJRAT | ABBOTTABAD | SWAT |

info@smjaffer.com | www.smjaffer.com | 111-765-765

Gul Ahmed Textile Mills Appoints Mohammed Zaki Bashir as CEO

Gul Ahmed Textile Mills Limited (GATM) has appointed Mohammed Zaki Bashir as its Chief Executive Officer, effective April 1, 2026, according to a notice submitted to the Pakistan Stock Exchange.

The company informed that Bashir, who already serves as a director on the Board, will assume the role following the Board of Directors' decision.

Bashir joined GATM in 2005 and became a board member in 2008. He holds a degree in International Business from Regents Business



School, UK, and is a certified director from the Pakistan Institute of Corporate Governance.

He is also actively associated with key industry bodies, serving on the Executive Committee of the All Pakistan Textile

Mills Association and as a director on the board of the Pakistan Textile Council. In addition, he is a member of the Entrepreneurs' Organization and the Young Presidents' Organization (YPO) Pakistan.

Gul Ahmed Group traces its origins back to the early 1900s as a textile trading business and established its manufacturing operations in 1953. The company was listed as a public entity in 1955.

Today, GATM operates as a composite textile mill engaged in the manufacturing and sale of textile products, alongside a strong retail presence with more than 40 outlets nationwide offering fashion, clothing, and home textile products. — ER News Desk

OGDCL Announces Start of Production from Spinwam-1 Discovery

Oil and Gas Development Company Limited (OGDCL) has announced the commencement of gas and condensate production from the Spinwam-1 discovery located in the Waziristan Block, Khyber Pakhtunkhwa, under the Extended Well Testing (EWT) phase, according to a disclosure submitted to

the Pakistan Stock Exchange.

The company said the well has been completed in the Lockhart reservoir and is currently producing approximately 40 million standard cubic feet per day (MMscfd) of gas along with around 200 barrels per day (BBL/D) of condensate.

With the addition of production from Spinwam-1, the early production facilities established at Shewa are now operating at full capacity. The combined output from the Shewa and Spinwam

wells is expected to reach approximately 100 MMscfd of gas and 800 BBL/D of condensate.

The Waziristan Block is operated by Mari Energies Limited with a 55 percent working interest, while OGDCL holds 35 percent and Orient Petroleum Inc. holds 10 percent stake.

The development marks a significant step towards enhancing domestic hydrocarbon production and supporting the country's energy requirements. — ER News Desk

Academic Excellence and International Collaboration

A Milestone Achievement in 5G Railway Communication Research

Mehran University of Engineering & Technology (MUET) proudly announces the successful completion of the PhD degree of Mr. Yahya S. Junejo in 5G Telecommunication Engineering, marking a significant milestone in advancing academic excellence through international collaboration.

Mr. Junejo's doctoral research was conducted under a prestigious joint supervision arrangement between MUET, Pakistan and Lakehead University, Canada. This collaboration, formalized through a Memorandum of Understanding (MoU) in 2022 under the National Centre for Robotics and Automation (NCRA) initiative, enabled access to advanced research infrastructure, including state-of-the-art

5G laboratory facilities. Such partnerships reflect the growing importance of global academic linkages in addressing complex engineering challenges.

His PhD thesis, titled "Improving Handover Management in High-Speed Rail Communications," addresses a critical issue in modern telecommunication systems—ensuring seamless connectivity in high-speed mobility environments. The research contributes valuable insights toward enhancing the reliability and efficiency of next-generation wireless communication systems, particularly in the context of smart transportation and high-speed rail networks.

This achievement underscores the vital role of international research collaboration in strengthening institutional capacity, fostering innovation, and producing globally relevant solutions. The work was supported by multiple funding bodies, including the ICTEF4SD, Mitacs

Globalink, Graduate Research Assistant (GRA) funding, and Natural Sciences and Engineering Research Council of Canada (NSERC).

The research was supervised by Prof. Dr. Faisal Karim Shaikh, Chairman, Telecommunication Engineering Department, MUET, and co-supervised by Prof. Dr. Bhawani Shankar Chowdhry (SI), Distinguished National Professor, MUET, in collaboration with Dr. Waleed Aijaz, Head of the Wireless Communication & Networks (WCN) Research Group at Lakehead University. This collaborative supervision provided access to



advanced facilities and expertise, further strengthening research outcomes.

This success story highlights that academic

excellence combined with strong international collaboration is the need of the hour for developing innovative, high-impact solu-

tions and positioning Pakistani institutions at the forefront of global research and technological advancement. - PR

K-Electric appoints Syed Taha as new Chief Executive Officer

K-Electric Limited (KE) has appointed Syed Taha as its new Chief Executive Officer, replacing interim CEO Adeeb Ahmad, with effect from April 15, 2026.

According to a company statement, the appointment was approved by KE's Board of Directors as part of its leadership transition plan.

Mr. Taha holds an engineering degree along with an MBA in Finance from the Institute of Business Administration, Karachi. He has been serving as Managing

Director and CEO of Pakistan State Oil Company Limited (PSO) since February 2020.

Prior to joining PSO, he worked as Executive Director at Oasis Energy, where he headed the Program Management Office of the Port Harcourt Electricity Distribution Company in Nigeria. He also previously served as Chief Distribution Officer at K-Electric and has held several senior roles across various organizations.

The appointment marks a return to KE for Mr. Taha, bringing with him extensive experience in the energy and power sector both locally and internationally. - ER

Symmetry Group Wins Multiple Honors in Asia's Best Companies Poll 2026

Symmetry Group Limited has secured multiple accolades in the Asia's Best Companies Poll 2026 conducted by FinanceAsia, a leading

Company - Technology, Silver for Best Managed Company - Media & Entertainment, and Silver for Best Use of Technology.

The Asia's Best Companies Poll is based on evaluations by investors and finan-

cial analysts across the region and reflects corporate performance over the past year.

The company said the recognition highlights its continued focus on innovation, operational excellence, and value creation for stakeholders. - ER Report



publication covering Asia-Pacific capital markets.

According to a company statement, Symmetry Group received top recognitions in the Pakistan category, including Gold for Best Managed

FAKHRI
Group of companies.

The Air-Conditioning, Insulation & Fire Fighting People

Complete Solution of Central Air Conditioning, Fire Fighting, Renewable Energy Products & Manufacturing of PU/PIR Sandwich Panel

TROX KOREA Copper Tubes, Pipes & Fittings	MUELLER INDUSTRIES USA Copper Tubes, Pipes & Fittings	BAOLAI Carbon Steel Seamless Pipes ASTM A53/A106 Grade B Schedule 40	NAFFCO PASSION TO PROTECT Complete Range of Fire Fighting Products
AEROFOAM COMPLETE SOLUTION OF FLEX & RIGID INSULATION	Pal Pre-insulated Aluminium Duct System	ECO PANEL All types of PU-PIR Sandwich Panels	KIMMCO Glasswool Insulations
ABRO USA Duct Insulation Tapes	LG KOREA Complete Range of Reciprocating, Rotary & Scroll Compressors	WEISS INSTRUMENTS USA Industrial Thermometers & Pressure Gauges	galco climalife Belgium Refrigerant Gases R-22, 134A, R404A, 407C, 410A & R-141B
Honeywell USA Refrigerant Gases & Hvac Controls	GALA USA Regulating Systems	THERMO COPPER Technical Specification	NEFIT Butt-Welded Pipe Fittings Tianjin

Phone: 021-35886201-5 Email: info@fakhribrothers.com Website: www.fakhribrothers.com

Karachi • Lahore • Rawalpindi • Dubai • Sharjah • Abu Dhabi • Qatar



Agriculture Review



US–Israel–Iran War: Where Does Pakistan’s Food Security Stand?

For now, doomsday scenario such as a full-scale escalation involving a US attack on Kharg Island is set aside for a while. However, even without such escalation, a key question remains: in the current geopolitical environment, where does Pakistan’s food security stand?

So far, amid the US–Israel–Iran tensions, Pakistan has retained a critical advantage; its supply lines remain intact, and essential goods continue to flow into the country. Oil imports, which are vital for agricultural operations, have not been disrupted. Pakistan consumes around 480,000–500,000 barrels of oil per day, of which approximately 400,000 barrels per day are imported, accounting for nearly 80–85

percentage of total demand. Similarly, Pakistan relies

heavily on imported potash (potassium), a key fertilizer

input. The country imports around 250,000–300,000 tonnes of potash annually, primarily from global mar-

kets routed through Gulf supply chains. Encouraging-

ing China, United Arab Emirates, Saudi Arabia, and managed through carryover stocks or limited imports. Current crop conditions suggest that availability this year may be better than last year, providing some buffer against external shocks. Pakistan is generally not a major wheat exporter, focusing instead on meeting domestic demand.

Despite months of geopolitical tension, agricultural activities across the country continue largely uninterrupted, and the overall situation remains stable. Pakistan’s geographic advantage as a non-landlocked country allows access to multiple maritime trade routes, although challenges with neighboring Afghanistan persist.

However, if the conflict becomes prolonged, risks could emerge for the upcoming Kharif season. Fertilizer supply chains, fuel costs, and transportation logistics may come under pressure. At present, essential commodities are available in sufficient quantities in domestic markets.

Even so, a paradox persists: while wheat prices remain relatively low, flour prices are high. Two key factors explain this trend—first, rising global oil prices have increased transportation and distribution costs; second, market perceptions driven by uncertainty and geopolitical risk are exerting upward pressure on prices. ■



heavily on imported potash (potassium), a key fertilizer

tonnes of potash annually, primarily from global mar-

ly, nitrogen-based fertilizers such as urea are largely produced domestically, reducing dependence on external sources for this critical input.

However, Pakistan’s agricultural exports are beginning to feel the strain. Trade with Iran plays a role in regional agricultural flows, particularly for mangoes, kinnow (citrus), rice, and some livestock products. Overall, Pakistan’s agricultural exports exceed US\$7–8 billion annually, with major markets includ-

European Union countries. While Iran is not the largest destination, disruptions in regional trade routes and border dynamics could affect specific export segments, particularly from Balochistan and southern Punjab.

In terms of food security, wheat remains the cornerstone. Pakistan produces approximately 27–28 million tonnes of wheat annually, while domestic consumption stands at around 30 million tonnes, leaving a modest gap that is typically

IEEEPEP 2026 INDUSTRIAL MEGA EXHIBITION

“SHOWCASING PAKISTAN’S ENGINEERING INDUSTRY”

4th – 6th May, 2026

EXPO CENTER LAHORE



PLATINUM SPONSOR: PEL, JAWAD SIGMA, GM, AL-KAFI, OLIVER, AUTONICS, PHENIX CONTACT, EMCO.

SUPPORTING BODIES: NEECA, REAP, PISA, SETUP, MEDIA PARTNERS: ENGINEERING REVIEW.

Organized by



FOR BOOKING
CONTACT US:

+92 300 6305982
+92 301 8266831
+92 300 8446073
Info@ieeepexpo.com

www.ieeepexpo.com

Lucky Core Inaugurates Vet Medicine Facility in Sheikhupura

Lucky Core Industries Limited has inaugurated a new veterinary medicine manufacturing facility at its Sheikhupura site, marking a significant step in the expansion of its Animal Health

business. The new plant is expected to strengthen the company's local manufacturing footprint and enhance its veterinary business operations, supporting its broader strate-

gic growth plans.

The development underscores Lucky Core Industries’ continued focus on expanding its capabilities in the animal health segment while contributing to the



business.

According to a notification issued to the Pakistan Stock Exchange, the facility

ny’s local manufacturing footprint and enhance its veterinary business operations, supporting its broader strate-

growth of Pakistan’s livestock and agriculture sectors. — ER Report

Navigating the Future of Careers in Pakistan in the AI Era

By Prof. Dr. Tariq Rahim Soomro, SMIEEE

We rode the wave of free-lancing through Upwork, survived the dot-dot-dot bubbles, and watched the rise of a startup ecosystem centered in Karachi, Lahore, and Islamabad. But nothing—absolutely nothing—has moved the tectonic plates of our career landscape quite like Generative AI.

Let's discuss the realistic scenario for the Pakistani job market over the next 5 to 10 years. This isn't about whether AI will take our jobs; it is about how the structure of employment in Pakistan is being rewritten in real-time.

For the last 15 years, a massive chunk of Pakistan's tech employment has been built on arbitrage—specifically, the difference between the US dollar and the PKR, and the willingness of Pakistani engineers to work for \$30 to \$10 per hour or less doing what US engineers do for \$100 per hour. We are already seeing a shift in the export industry. Tasks that used to require a team of five junior front-end developers or content writers are now being handled by one senior developer using AI copilots (Cursor, Copilot, etc.) and one AI editor. The demand for generic coding skills is dropping. The Pakistani freelancer who relies on basic HTML/CSS tweaks, simple WordPress development, or standard content writing is facing a saturated market where AI tools have drastically lowered the barrier to entry. We will likely see a bifurcation. The lower end of the market (routine software development, basic data entry, standard copywriting) will experience a "race to the bottom" in pricing, forcing many professionals to either upskill drastically or exit the tech-adjacent gig economy.

Pakistan's local enterprise sector—banking, textiles, retail, and telecom—has traditionally been slow to adopt tech. However, the pressure to cut costs is forcing a change. We are entering

an era where local companies will no longer hire coders; they will hire AI-augmented teams. Instead of a hierarchy of 1 Project Manager + 5 Developers + 2 QA + 1 DevOps, the structure is shrinking to 1 Product Lead + 2 AI-Augmented Engineers. In the Software Houses, the "body rental" model (where Pakistani companies rent out engineers to foreign clients by the headcount) is facing an existential threat. Clients are now asking: "Why do I need 10 engineers, when AI can handle the boiler-plate?". The value proposition is shifting from manpower to expertise. The Pakistani companies that will thrive are those that sell solutions, not hours. They are hiring Architects—people who understand system design, security, and how to integrate AI models (local or cloud) into legacy systems.

Pakistan produces hundreds of thousands of graduates every year. In the past, if you weren't a software engineer, your chances in the digital economy were slim. AI is changing that now. We are entering a phase where English proficiency + Domain Expertise + AI Tooling is becoming a viable career path, bypassing traditional coding. A graduate with a degree in Accounting, Business, Economics, Social Sciences, or even a skilled tradesperson, can now leverage AI to become a "Prompt Engineer", "AI Workflow Specialist", or "Data Labeling Supervisor". Pakistan has a young, English-speaking population. Global AI companies (and local ones) need massive amounts of data labeling, model fine-tuning, and local language model (Urdu/Regional) development. This creates a new tier of "AI Operations" jobs that didn't exist three years ago. These are not traditional STEM jobs, but they are high-value digital jobs.

As a computer professional observing this market, I see three distinct survival strategies for the Pakistani workforce:

1. For Developers: If your stack is purely "MERN" (MongoDB <database>, Express.js

<back-end framework>, React.js <front-end library>, and Node.js <server-side runtime>) with no specialization, your bargaining power is wearing away. The market is demanding AI Integration Specialists. If you can build RAG (Retrieval-Augmented Generation) – an AI framework, pipelines, fine-tune LLMs on local Urdu data, or secure cloud infrastructure for AI workloads, you are not just safe—you are in the top 1% of earners in the country.

2. For Businesses: The old model of selling developers by the numbers is over. Pakistani IT companies must rebrand themselves as AI transformation partners. Foreign clients will pay premium dollars not for a coder, but for a partner who can reduce their operational costs using AI. This requires sales teams to understand tech deeply—a rare skill in our current market.

3. For Fresh Graduates: Universities in Pakistan are not keeping up. While students learn outdated curricula, imposed by the Higher Education Commission and accreditation Bodies, the industry needs people who understand how to connect OpenAI APIs to local databases. The "Last Mile" gap—knowing how to deploy a model, manage latency, and handle hallucinations—is where the money is. A fresh graduate with a strong portfolio of AI-integrated projects will out-earn a 10-year expert who refuses to adapt.

Pakistan's AI future is hampered by two things:

1. Brain Drain: The best AI talent is leaving for the UAE, KSA, and the West because of the economic situation, Pak Rupees to Dollar rate, Taxations, local infrastructure (power outages, internet disruptions, visa policies) makes running high-stakes AI operations unstable, along with other obvious reasons.

2. The Internet Wall: AI is an internet-first industry. If we face prolonged internet shutdowns or throttling, the market will simply bypass Pakistan. We saw a preview of this in



2024; foreign clients started shifting their contracts to Vietnam and Latin America when connectivity became unreliable.

The future of careers in Pakistan in the era of AI is not a story of undesirability; it is a story of compression and elevation. The middle tier is being compressed. The low-skill digital jobs are disappearing. But the top tier—the AI engineers, the product architects, the prompt engineers, and the business leaders who understand how to deploy these tools—are seeing opportunities that were unimaginable two years ago. For the Pakistani computer professional, the mantra must change. We can no longer sell hours, rather we must sell intelligence. The era of simply being a coder is over. The era of being an orchestrator—someone who commands machines to build for humans—has just begun.

Prof. Dr. Tariq Rahim Soomro is the Rector at the Institute of Business Management (IoBM), Karachi, and has more than 30 years of experience in academia and industry. He can be reached at tariqsoomro@gmail.com ■

Professional Club

Engineering Review

ASSOCIATED CONSULTING ENGINEERS ACE LIMITED

Established in 1958, ACE, being a multi-disciplinary and multi-sectoral organization, has become one of the premier engineering consulting house of Pakistan in the Private Sector.

FIELDS OF ACTIVITIES:

- Dams and Barrages • Irrigation and Drainage • Power Engineering
- Public Health Engineering • Architecture and Town Planning
- Highways & Transportation Engineering
- Environmental Impact Assessment • Socio-Economic Studies
- Industrial Engineering • Hydraulic Structures
- Environmental Planning • Ground Water Resources Development
- River Basin Projects • Flood Control

SERVICES:

- Project Planning • Surveys & Investigations
- Feasibility Studies • Conceptual Designs
- Preliminary & Detailed Designs • Tender Documents
- Contract Award Process • Construction Supervision
- Management Consultancy • Inspection & Remedial Works
- Operation & Maintenance • Project Management
- Institutional Development & Capacity Building
- Training

website: www.acepakistan.com

Corporate Office
D-185, KDA Scheme No. 1, Tipu Sultan Road, Karachi-75350, Pakistan
Tel: (92-21)34530825, 34534128, 34539219
Fax: (92-21)34546679 Email: corporate@acepakistan.com

Regional Office (North)
1/C-2, M.M. Alam Road, Gulberg-III, Lahore-54660
Tel: (92-42)35759417-9 Fax: (92-42)3575276
Email: aceron@brain.net.pk, aceron@acepakistan.com

Regional Office (South)
C-35, Muhammad Ali Cooperative Housing Society, Tipu Sultan Road, Karachi-75350
Tel: (92-21)34320111-76 Fax: (92-21)34141175
Email: acesouth@gmail.com, acesouth@acepakistan.com

Transportation Engineering Services
36-Civic Centre, 3rd Floor, M-Block, Model Town Ext. Lahore-54700
Tel: (92-42)35171081-3 Fax: (92-42)35171084
Email: ace.transportation@acepakistan.com

ACE Architectural & Town Planning Services
36-Civic Centre, Ground Floor, M-Block, Model Town Ext. Lahore-54700
Tel: (92-42)35170871-4 Fax: (92-42)35170875
Email: acearts@acepakistan.com

Islamabad Office
Suit # 101, Victoria Heights, Sohan, (Near Sohan Overhead Bridge), Main Service Road East, Islamabad Expressway, Islamabad
Tel: (92-51)2612283, Fax: (92-51)2612294, WhatsApp: 0309-6649732

Peshawar Office
House No. 1945, Azalabad Old Bara Road, University Town, Peshawar
Tel: (92-91)5700397
Email: acepeshawar@acepakistan.com

Foreign Offices: Malaysia, Indonesia

NATIONAL DEVELOPMENT CONSULTANTS (PVT.) LIMITED

FIELDS OF ACTIVITIES

- Dams & Hydropower
- Irrigation & Drainage Design
- River Training & Flood
- Transportation & Tunneling
- Public Health & Environmental
- Agriculture & On-Farm
- Building & Urban
- Physical & Numerical
- Surveys & Investigations

SERVICES

- Feasibility Studies
- Detailed Engineering Design
- Contract Administration
- Construction Supervision
- Third Party Validation
- Engineering/Monitoring
- Tender Documentation
- Water
- Management Bid Evaluation
- Rehabilitation Including Development QA/QC
- Operation &

NDC Head Office:
114, Sector-A, Commercial Broadway, Phase-VIII, Defence Housing Authority, Lahore, Pakistan
Tel: +92-42-37135034-37 Fax: +92-42-37135038
Email: ndc@adeepak.com Website: www.ndepak.com

JAFRI AND ASSOCIATES (Pvt) Ltd. CONSULTING ENGINEERS

Since 1971

Electrical
Grid Stations, EHV/MV/LV Distribution System; Commercial; Residential; Industrial Installation; BMS Bldg LV system; Computer Networking; Lifts and Escalators.

Energy and Power Generation
Energy Audit/ Conservation; Energy Management Systems; Standby and Base Load Power Generation, Co-Generation; Solar Energy; Wind Energy; Renewable Sources e.g. MSW and Bio Mass Based Plants etc.

Heating, Ventilation and Airconditioning
Air-conditioning of all types of buildings; Refrigeration Systems; Humidification; Air Treatment; etc.

Room # 206, 2nd Floor, Ibrahim Trade Tower, Maqbool Co-operative Housing Society, Shahra-e-Faisal, Karachi 75400.
Ph # +92-21-34327671-4, Fax # +92-21-34327675
E-mail: jafriandassociates@gmail.com
website: www.jafriandassociates.com.pk

ATIF NAZAR (PVT.) LTD.

PROJECT MANAGERS | ARCHITECTS | PLANNERS | CONSULTING ENGINEERS

ENGINEERING EXCELLENCE
DELIVERING SINCE 1982

INFRASTRUCTURE
• Water Supply
• Sewage
• Storm Water Drainage

TRANSPORTATION
• Highway Design
• Bridge Design
• Traffic Engineering

STRUCTURAL
• Building Design
• Bridge Design
• Retrofit & Strengthening

MECHANICAL/PLUMBING
• HVAC Systems
• Plumbing
• Fire Protection

ARCHITECTURE/INTERIOR
• Architectural Design
• Interior Design
• Building Planning

PLANNING
• Urban Planning
• Regional Planning
• Space Planning

ELECTRICAL & CCTV
• Power Distribution
• Lighting Design
• CCTV & Security

HEALTHCARE
• Hospitals
• Clinics
• Allied Health Facilities

INNOVATION | QUALITY | SUSTAINABILITY | EXPERIENCE

D-11/A, Block 17, Gulshan-e-Iqbal, Karachi, Pakistan
www.atifnazar.com | mail@atifnazar.com | +92 21 34362561

A.E.A. INTERNATIONAL (PVT.) LIMITED

PLANNERS & CONSULTING ENGINEERS

MEP and Renewable Energy Consulting Engineers

We offer consultancy services in the following fields:

- Power Generation & Distribution
- Internal & External Lighting
- Flood Lighting
- Heating, Ventilation & Air-Conditioning
- Tariff & Bill verification
- Earthling & Lightning Protection
- Co-Generation System
- Renewable Energy (Solar PV & Wind)
- Fire Alarm & Security Systems
- Fire Fighting Systems
- Networking & CC TV
- Industrial Environment Control

Energy Audit & Safety Survey of Electrical & Mechanical Systems
Suite # 313, 3rd Floor, Anum Estate, Shahra-e-Faisal, Karachi-75350.
Tel: +92 21 34311985-6; Cell: +92 345 2123474
E-mail: info@aea-age-green.com - aea.i@yahoo.com
web: www.aea-age-green.com

KPWS CONSULTING

We operate in the following areas:

- Electrical and Power Engineering
- Building Systems
- Power Generation & Heat Recovery
- Energy Management
- Renewable Energy
- HVAC
- Plumbing, Water treatment
- Firefighting
- Solid Waste treatment & disposal

Our Services include:

- Engineering services: End-to-end conceptualization, design, documentation, tendering, procurement support and construction supervision
- Studies: Feasibility and specialist techno-commercial studies related to Energy, Power systems, Mechanical systems, Plumbing, Security, etc.
- Audits: Fire Safety, Energy System Worthiness, Power Quality, Hazardous Installations, etc.
- Renovation/Augmentation: Electrical, HVAC, Plumbing, ICT, Building Systems, Security, Utilities, etc.

304, Progressive Square, Block-6, PECHS, Shahrae Faisal, Karachi - 75400
T: (+9221) 34321350-1 | info@kpwsconsulting.com | www.kpwsconsulting.com

ADOMATION
www.cadomation.com

CAD Customization • CAD Automation

CAD Migration • CAD Drafting

CAD Cartography • 3D Printing & Diorama

THE SPATIO
Engineering & Geo-Spatial Consultants

92-42-3546 898 2

info@thespatio.com | info@cadomation.com

www.thespatio.com | www.cadomation.com

Eleken ASSOCIATES

Consulting Engineers, MEP & IT

Electrical
• Power Generation
• HV, MV, LV Distribution System
• Electronic Safety & Security
• Automation & IBMS
• Renewable Energy

M & P
• HVAC System
• Plumbing
• Fire Fighting
• Water Treatment

Specialized Services
Value Engineering
Construction Management
Energy Audit

eleken@eleken.com
021 3432-5537
Suite 513, RSM Square, Shaheed-e-millat, Karachi

Techno-Consult International (Pvt) Ltd

Consulting Engineers

Over 50 years of Professional Services

37 - K, Block -6, P.E.C.H.S., Karachi - 75400 Pakistan,
Tel: (92-21)3453 0630/31/32, 34557392, 34557425
Fax: (92-21)3454 6606 E-mail: email@techno-consult.com

Maritime Ports Harbours Coastal Engineering, Dams
Irrigation Canals Water Resource, Roads & Highways,
T.C.I. is very Senior Consulting Engineering firm of Pakistan.

Engr. Al Kazim Mansoor
B.E. (Civil), M.S. Geotech (U.S.A.) P.E.
Consulting Engineer
0300-8207186

Geotechnical, Material, Structural Engineering & Testing Laboratories

SOILMAT ENGINEERS

B-136, Block 1, Opp: N.E.D. University,
Main University Road, Gulistan-e-Jauhar, Karachi.
Ph: 34623161-2, 35458647; Fax: 021-34632483
Web site: www.soilmatengineers.com

Industry 5.0 and Green Engineering: Human-Centric Sustainable Production

Engr. Dr. Muhammad Nawaz Iqbal

Industry 5.0 redesigns the production architecture in order to place human beings at the center of highly technological operations, producing a synthesis of human creativity and intelligent automation.

In contrast to Industry 4.0, which focused on efficiency and digitization, Industry 5.0 is focused on purpose-driven production, in which sustainability, resilience, and human well-being become priorities. Green engineering will be the working prototype of this paradigm, whereby all production phases must be in line with ecological balance and remain economically feasible.

Human-centric design and green engineering merge to bring about a radical change in the conceptualization of industrial systems. Production does not only remain an activity of maximizing output but rather becomes an adaptive ecosystem in which human understanding works together with machine intelligence to reduce energy degradation. Designing efficient systems is no longer sufficient; engineers are now expected to design systems that are regenerative. Hence, sustainability must be integrated into the product lifecycle, which includes the extraction of raw materials and the dis-

posal process. Sustainable production that is human-centered includes emotional intelligence, ethical reasoning, and tacit knowledge in industrial processes. Collaborative robots (cobots) are not a substitute but rather an addition to workers and allow them to be safer, more efficient, and more environmentally responsible. This solution minimizes the wastage of resources and energy usage, as it utilizes human intuition to aid in decision-making that cannot be optimally performed by machines alone.

Green engineering in Industry 5.0 goes beyond environmental requirements and promotes advancement in material science, energy systems, and process optimization. Circular production methods, bio-based materials, and the integration of renewable energy are all part of its operating components. Such innovations allow industries to move away from the linear "take-make-dispose" model toward the concept of a circular ecosystem in which waste is eliminated. Predictive sustainability is made possible through the role of digital twins and AI-based simulations in Industry 5.0. Through real-time modeling

of environmental impacts, organizations are able to pre-design processes that minimize carbon footprints and resource inefficiencies. This proactive perspective makes sustainability an active compliance role rather than a reactive one, thereby turning it into a competitive advantage.



Human-centricity also transforms labor relations by providing meaningful work environments where skills, creativity, and well-being are prioritized. Employees become co-producers of sustainable production systems as they present ideas that improve productivity and environmental stewardship. This participatory model enhances organizational commitment and aligns individual values with overall sustainability objectives.

Industry 5.0 makes it possible to achieve hyper-personalized production

without affecting environmental sustainability. Companies can create tailor-made products with minimal material consumption through advanced manufacturing technologies such as additive manufacturing. This balance between personalization and sustainability challenges the classical trade-off between

variety and efficiency. Industry 5.0 promotes closed-loop supply chains through green engineering principles. The recycling, reuse, and repurposing of materials significantly reduce reliance on virgin resources. Supply chains become transparent and traceable, enabling organizations to track environmental impacts throughout the value chain. Industry 5.0 is also characterized by the integration of renewable energy systems into production processes. Smart grids, decentralized energy systems, and energy storage solutions enable

industries to operate with lower carbon emissions. These systems are efficiently managed with human supervision to respond to changing energy needs and environmental conditions.

Resilience is one of the critical aspects of Industry 5.0, and green engineering helps create systems that can withstand environmental, economic, and social disruptions. Sustainable production systems are designed to be dynamic, ensuring continuity while minimizing ecological impact during crises. In Industry 5.0, ethical considerations come to the forefront, especially in balancing technological progress with environmental sustainability. Green engineering systems integrate ethical decision-making frameworks that guide the development and implementation of technologies so that innovation does not harm ecological or social well-being. Industry 5.0 can also pave the way for sustainable production through the collaboration of biotechnology and engineering. Bio-manufacturing processes utilize living organisms to generate materials and energy, significantly reducing environmental impact. Such a multidisciplinary approach exemplifies the innovative potential of combining human expertise with nature.

The development of Industry 5.0 largely depends on education and skill development. Engineers and managers will need interdisciplinary



nary skills that combine sustainability, technology, and human-centered design. This shift requires restructuring academic programs to produce a workforce driven by green innovation. The widespread adoption of Industry 5.0 practices also requires policy frameworks and institutional support. Governments and institutions must collaborate to incentivize sustainable production, invest in green technologies, and establish standards that promote environmental responsibility and innovation.

Research on Industry 5.0 and green engineering can lead to the development of a unified production model that addresses economic development, environmental sustainability, and human well-being. This paradigm represents not only a technological shift but also a philosophical transformation toward a more inclusive, ethical, and sustainable industrial future in which humans and machines co-create value in harmony with the planet. ■

Professional Club

Engineering Review



NATIONAL ENGINEERING SERVICES PAKISTAN (PVT.) LIMITED

A WORLD CLASS ORGANISATION OF CONSULTING ENGINEERS

FIELDS OF SPECIALISATION: Power and Mechanical, Water Resources Development, Agriculture, Architecture and Planning, Highways and Bridges, Airports and Seaports, Environmental and Public Health Engineering, Engineering for Industry, Building Services, Heating, Ventilation & Air-Conditioning (HVAC), Renewable Energy, Disaster Management and Reconstruction, Information Technology, Geographical Information System

SERVICES: Pre-feasibility and Feasibility Studies, Surveys, Planning, Investigations, Designs, Design Review and Vetting, Tender and Contract Documents, Construction/ Installation Supervision, Contract Management, Post-Construction Services, Public Private Partnership BOT Project Services, Asset Valuation

HEAD OFFICE: NESPAK House, 1-C, Block-N, Model Town Extension, P. O. Box: 1351 Lahore 54700, Pakistan
Tel: 92-42-99090000 Fax: 92-42-99231950
E-mail: info@nespak.com.pk Website: www.nespak.com.pk

REGIONAL OFFICES: Karachi, Islamabad, Peshawar, Riyadh, Muscat, Doha, Kabul



Geotechnical Investigation (On-Shore & Off-Shore)

Geotechnical Design:
◆ Bearing Capacity Evaluation
◆ Liquefaction Potential
◆ Swell Potential
◆ Slope Stability
◆ Shoring System for Deep Excavation
Field Testing:
◆ Standard Penetration Test
◆ Undisturbed Sampling
◆ Rock Core Sampling
◆ Field Density
◆ Grouting Test
◆ Water Pressure Test (Lugeon Test)
◆ Permeability Test
◆ Menard Pressure-Meter Test
◆ Cone Penetration Test (CPT)
◆ Vane Shear Test

Laboratory Testing (NESPAK Approved)

Soil Gradation
◆ (Sieve & Hydrometer)
◆ Atterberg Limits
◆ Shrinkage Limits
◆ Unconfined Compression Test
◆ Direct Shear Tests
◆ Consolidation
◆ Swell Potential
◆ Bulk & Dry Density
◆ Natural Moisture Content
◆ Chemical Test for Soil & Water
◆ Modified / Standard Proctor Test
◆ California Bearing Ratio (CBR)
◆ Permeability Test
Soil Test:
◆ Double Hydrometer for Dispersive Soils
◆ Water Absorption
◆ Swell Pressure
◆ Knight Collapse Potential

◆ 3-Point Soaked CBR
◆ Pinhole
◆ Crumb Test
◆ Specific Gravity
Rock Testing:
◆ Bulk Density
◆ Dry Density
◆ Moisture Content
◆ Porosity
◆ Water Absorption
◆ Specific Gravity
◆ Uniaxial Test
◆ Elastic Modulus
◆ Poisson Ratio
◆ Point Load
◆ Brazilian Test
◆ Slake Durability
◆ Petrography

14-A/1, Block-P, Model Town Extension, Lahore.
Tel: 042-35713362; 042-35713364; 0347-4625111; 0347-4625222
Email: decon@decon.com.pk Web: www.decon.com.pk

SEP
SEM-ENR Partnership
YOUR MEP DESIGN PARTNER

40+ YEARS OF LEGACY | 1500+ PROJECTS | 150+ STAFF

• HVAC • FIRE PROTECTION
• ELECTRICAL • PLUMBING & SANITARY
• IT & COMMUNICATION • VERTICAL TRANSPORT
• SAFETY & SECURITY • LIFE SAFETY
• LEED CERTIFICATION • BIM SERVICES

AFFILIATIONS
ASHRAE, NFPA, BSI, PSPP

13P-A, Ground Floor, Block-3, P.E.C.H.S. Karachi
24-A, Block 3/1, Outgoing 211, Lahore

The First Engineering Consultancy Company

ECIL

since 1959 in Pakistan

SERVICES
◆ Transportation
◆ Roads & Highways
◆ Marine
◆ Architecture & Planning
◆ Environmental
◆ Power
◆ Special Services
◆ Non-Destructive Testing (NDT)
◆ Post Completion Audit
◆ Project Management
◆ Economic Feasibility
◆ Data Collection
◆ Irrigation & Agriculture
◆ Surveying
◆ Investigation
◆ Research & Development
◆ Asset

Engineering Consultants International (Pvt.) Ltd.
Head Office: 29, Block 7/8, D.A.C.H. Society, Sharea Faisal, Karachi-75350 PAKISTAN
Voice: +92 (21) 3454-2290 (4 lines) 3430 2271 (4 lines),
Fax: +92 (21) 3454-5255,
E-mail: info@ecil.com URL: http://www.ecil.com

Islamabad: 23-A, Bhitai Road, (Old School Road), Sector F-7/1, Islamabad
Ph: +92 (51) 265 1993 (3 lines)
Fax: +92 (51) 265 1996,
E-mail: info@ecil.com

Houston, United States of America
611, 6011 Hillcroft Avenue,
Houston, TX 77081, USA
Ph: +1 713 272 7184, Fax: +1 713 995 4744,
E-mail: info@ecil.com

Almaty, Kazakhstan
925, 142 Bogoyavl Batyr Street,
Almaty 480091, Kazakhstan
Tel/Fax: +7 (3272) 508 001, 508 002
E-mail: info@ecil.com

Dubai, UAE
307 Al-Nayli Building, Abu Hal Road,
Almaty 480091, Kazakhstan
Ph: +971 4 297 3288, Fax: +971 4 297 3299
E-mail: info@ecil.com

edbo

Ihtisham H. Zarrar
B.Sc (Civil Engg)
M. Sc Struct. (London)
M.I.E (Pak), P.E (Pak)

Services:
Highway • Bridges
Structures • Communication Towers
• Architecture

Engineering Design Bureau
Consulting Engineers, Planners & Architects

30-A Nazam-ud-Din Road, F-7/1 Islamabad.
Ph: +92-51-8432832, 8432833
Fax: +92-51-2651020
E-mail: izarrar@edbo.com.pk

216-A, Ground Floor, S.M.C.H.S. Karachi.
Ph: +92-21-34525111
Fax: +92-21-34556128
E-mail: izarrar@edbo.com.pk

271-M, Middle Town Extension, Lahore.
Ph: +92-42-35169798, 35177494
Fax: +92-42-35168429
E-mail: izarrar@edbo.com.pk

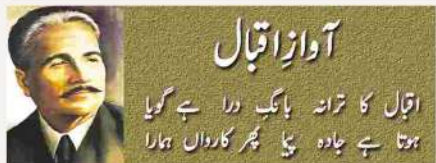
FND
Fahim, Nanji & deSouza (Pvt.) Limited
Consulting Engineers

OUR MEP SERVICES

MECHANICAL
◆ Air-Conditioning & Refrigeration
◆ Cogeneration
◆ Plumbing
◆ Fire Protection
◆ Steam Plants
◆ LPC - Air Mix Plant
◆ Oil Storage
◆ Fire & Life Safety Analysis
◆ Alternate Energy Systems
◆ Acoustical Engineering
◆ Solid Waste Management

ELECTRICAL
◆ Power Distribution
◆ Lighting Design
◆ Communication
◆ Fire & Security Alarm Systems
◆ Stand-by Emergency Power
◆ ELV Systems
◆ Vertical Transportation System
◆ Building Management Systems
◆ Electrical Safety Audit

4th Floor, ILACO House, State Life Building No.5,
Abdullah Haroon Road, Saddar, Karachi-74400, Pakistan
Phone: 92-21-35637878 & 82
Email: info@fnd.com.pk
Website: www.fnd.com.pk



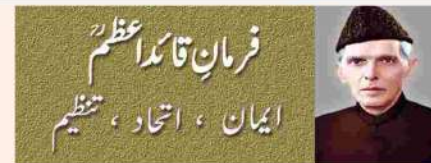
آوارا اقبال

اقبال کا ترانہ باگب درہا ہے گویا
ہوتا ہے جاوہر پیکر کارواں ہمارا

آہ! یہ دست جو اے گل رنگیں نہیں
کس طرح تجھ کو یہ سمجھاؤں کہ میں گل چیں نہیں
کام مجھ کو دیدہ حکمت کے انجھیروں سے کیا
دیدہ بلبل سے میں کرتا ہوں نظارہ تر

تو شناسائے خراش عقدہ مشکل نہیں
اے گل رنگیں ترے پہلو میں شاید دل نہیں
زیب محفل ہے شریک شورش محفل نہیں
یہ فراغت بزم ہستی میں مجھے حاصل نہیں
اس چمن میں، میں سراپا سوز و ساز آرزو
اور تیری زندگانی ہے گداز آرزو
توڑ لینا شاخ سے تجھ کو مرا آئیں نہیں
یہ نظر غیر از نگاہ چشم صورت میں نہیں

پوری کوششیں کرنی چاہیے۔ جو لوگ فی الحال لاہور کی قرارداد
پاکستان کے خلاف ہیں ہمیں ان کے دل میں غیر ضروری تلخی
پیدا نہیں کرنی چاہیے۔ آخر ہمیں ضرورت ہی کیا ہے؟ مجھے پورا
پورا یقین ہے کہ ہمارے یہی حریف ایک نہ ایک دن محسوس کر
لیں گے کہ ہندوستان کے انتہائی پیچیدہ مسئلے کا واحد اور بہترین
حل قیام پاکستان ہے کہ جس کے قیام کی نظیر پوری دنیا کی
تاریخ میں نہیں ملتی۔
(پنجاب مسلم سٹوڈنٹس فیڈریشن-2 مارچ 1946ء)

فرمان قائد اعظم
ایمان، اتحاد، تنظیم

آزادی اور قربانی
پس جہاں تک ممکن ہو ہمیں اپنے حریفوں کو سمجھانے کے
لئے عقل اور دلیل سے کام لینا چاہیے۔ میں جانتا ہوں کہ دلیل
اور عقل ہمیشہ ہی کامیاب نہیں ہوتیں لیکن ہمیں اپنی طرف سے

GOLDEN JUBILEE



Founder

Najamul Hasan (Marhoom)

Founding Editor

Riazul Hasan (Marhoom)

Publisher / Managing Editor

Muhammad Salahuddin

Editor

Manzoor Shaikh

Honorary Consulting Editors

Prof. B. S. Chaudhry	Education
Engr. Farhat Adil	Civil Engg.
Engr. Khalid Pervaiz	Elect. Engg.
Engr. Abul Islam	Intl Business
Dr. Shahneela Zardari	Software Engg
Mahmood Nawaz Shah	Agriculture
Dr. Tariq Soomro	Information Tech
Mariam Durrani	Industry

Graphic Designer

Shaikh Muhammad Raza ur Rehman

Production Manager

Waheed Ahmed

Social Media

Muhammad Amin

Branch Manager (Lahore)

Hamza Idrees

Regional Manager (Islamabad & North)

Muhammad Arif

Annual Subscription

2,400

Advertisement Tariff

Display Ads (Colour)

Per Col. cm Rs.425

Full Page	240 Col.cm	Rs. 102,000
1/2 Page	120 Col.cm	Rs. 51,000
1/4 Page	60 Col.cm	Rs. 25,500
1/8 Page	30 Col.cm	Rs. 12,750

Engineering Bazar

A package for small budgets

Issues	10 Col.cm	15 Col.cm	20 Col.cm
24	Rs.75,000	Rs.112,000	Rs.149,000
12	Rs.38,500	Rs.57,000	Rs. 76,500

Professionals' Club

Only for listing consultants' specialties

Issues	4x6 cm	8x6 cm	8x12 cm
24	Rs.35,000	Rs.69,000	Rs.137,500
12	Rs.18,000	Rs.36,000	Rs. 70,500

Printer

Aslam Zaki, Ayisha Printers,
Eveready Chambers,
Off: Chundrigar Road, Karachi.



Member All Pakistan Newspapers Society

Head Office

305, Spotlit Chambers, Dr. Billimoria Street,
Off: Chundrigar Road, GPO Box 807,
Karachi-74200, Pakistan.
Ph: 021-3221-5961-62

+92 335 224 6787

Email: info@engineeringreview.com.pk
engineeringreview@yahoo.com

Lahore

Room # 29, 6th Floor
Goldmine Plaza

105-Ferozepur Road Lahore.

Ph: 042-3540-4622; Mobile: 0322-4881881

Email: engineeringreview_lahore@yahoo.com

Islamabad

3-B, Basement Tripple One Plaza,
Fazle Haq Road, Blue Area, Islamabad.
Ph: 051-2348-6200 Mobile: 0300-9202824
Email: engineeringreview_isb@gmail.com

www.engineeringreview.com.pk



Sales Blog for Young Engineers and Entrepreneurs

How Sara weaves a spell of magic on Ali through her personal selling skills?

Muhammad Tariq Haq | www.eslpk.com

Let's walk through a glamorous sales journey with Engineer Sara. Imagine a luxurious setting in a sleek, modern office with a view of the city skyline, setting the stage for this masterpiece transaction.

Sara, equipped with twenty years of experience in power generation and an MBA in Sales & Marketing, has a track record of successful sales to her credit.

Pre-approach Before approaching Ali, Sara learns about Ali's company requirements, financial stability, and decision-making hierarchy. Sara collaborates with her technical team to customize a power plant proposal that meets Ali's specific energy needs. Step 3:

Approach Sara reaches out to Ali with an email, sharing a concise executive summary of how the power plant could address his specific industrial challenges. She follows up with a phone call to schedule a meeting. Step 4:

es, she offers financial plans to alleviate budget concerns and suggests phased installation to minimize cost. Step 6:

Closing Sara senses Ali's apprehension easing with her convincing counterarguments. She uses trial closing techniques, asking, "If we can arrange a financing option that suits your cash flow?" When Ali nods, Sara smoothly moves into the closing phase, finalizing an agreement for Ali. Step 7:

Follow-up After the contract is signed, Sara schedules follow-up calls to ensure

SARA WEAVES

Magic

THROUGH THE

SEVEN STEPS OF SELLING

How Sara enchanted Ali — not with charms, but with world-class personal selling skills.

Rating:
9.7/10

1 PROSPECTING



Sara spots Ali at an industry event. His expanding business needs a reliable power solution.

✓ Identified the right prospect with real need & buying capacity.

2 PRE-APPROACH



Sara researches Ali's business, financials & decision makers. She customizes the 5MW proposal with her technical team.

✓ Deep preparation to tailor the perfect solution.

3 APPROACH



Sara sends a sharp, value-driven email followed by a confident call. Secures a face-to-face meeting.

✓ Clear, compelling first impression.

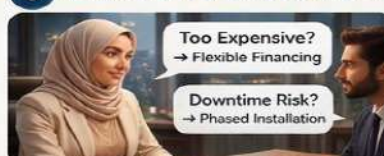
4 PRESENTATION



Sara presents ROI, cost savings & real-world case studies. Shows how the plant boosts efficiency & reduces energy costs.

✓ People buy outcomes, not products.

5 HANDLING OBJECTIONS



Ali raises concerns: Cost & Downtime. Sara offers smart financing & phased execution.

✓ Objections turned into opportunities.

6 CLOSING



Sara uses a trial close to confirm readiness. Guides Ali smoothly to final decision.

✓ Confident, professional close.

7 FOLLOW-UP



Sara ensures smooth installation, shares updates & sends a personal thank-you note. She invites Ali for a factory visit to — the plant in action.

✓ Built trust that turned into a long-term partnership.



OUTCOME: \$3 MILLION DEAL CLOSED



Power plant sold



Reputation earned



Relationship secured

Sara's 7-step spell is a MASTERCLASS in modern sales.

Where expertise meets empathy, trust is built — and deals are won.

Today, she faces a significant challenge: selling a \$3 million, 5MW AKSA power plant to a business genius Ali. Step 1:

Prospecting Sara identifies Ali as a potential customer through industry events and networking channels. Ali's business is expanding, and there is a clear need for a reliable power source to support his increased operational capacity. Sara gathers information about Ali's company size, power needs, and previous power solutions. Step 2:

Presentation In a face-to-face meeting, Sara leverages her technical expertise to present the customized proposal in detail. Using visual aids and concrete data, she showcases how the 5MW power plant will enhance operational efficiency, reduce energy costs. Her presentation is engaging, highlighting real-world successes and the ROI of such an investment. Step 5:

Handling Objections Ali expresses his concerns about the capital investment and the downtime associated with installation. Sara listens attentively, with strategic pauses

that Ali is satisfied with the progress. She sends a thank you note and offers assistance, maintaining a long-term relationship by providing updates and support. She arranges a factory visit for Ali & his team to witness the power plant in action, strengthening their rapport and securing his faith in Sara's commitment to excellence. The transaction is a hallmark of professionalism, showcasing Sara's ability to address both technical and business concerns. It is case study for all those who want to excel in sales! ■

Multiple Purpose Raw Food Washer
(Meat, Vegetables & Fruits)

LOW WATER CONSUMPTION
THOROUGH CLEANING
EASY TO USE
TIME SAVING
LOW LABOUR COST
INCREASE PROFITABILITY

NETWORK TRADE MARKETING
Ph: +92-21-36707233 - 36608964; Cell: +92 300 8299153
E-mail: ntmpiab@gmail.com Website: www.ntmpk.com

پندرہ روزہ

جینرل ریفیو

GOLDEN JUBILEE

50

ENGINEERING REVIEW

1975 - 2025

بانی: نجم الحسن
بانی ایڈیٹر: ریاض الحسن

+92-21-32215961-2, 32632567 • فون: 1-15, 2026, 07 • شمارہ نمبر: 51 • اپریل: 2026 • 1-15
www.engineeringreview.com.pk • ویب سائٹ: info@engineeringreview.com.pk • ای میل:



www.engineeringreview.com.pk www.youtube.com/engineeringreviewER

پاکستان میں گلیشیرز کا پگھلاؤ تیز، جھیلوں کے پھٹنے کے خطرات

درجہ حرارت میں اضافہ ٹپلی بلندیوں پر موجود گلیشیرز کا پگھلاؤ تیز کر سکتا ہے

تیزی سے پانی جمع ہونے سے جھیلوں کے پھٹنے کا خدشہ بڑھ گیا، محکمہ موسمیات

شمالی پاکستان میں بڑھتے ہوئے درجہ حرارت کے سبب گلیشیرز کے تیزی سے پگھلنے اور گلیشیائی جھیلوں کے پھٹنے کے واقعات میں اضافہ ہو سکتا ہے، محکمہ موسمیات کے جاری اعلامیے کے مطابق شمالی پاکستان میں بڑھتے ہوئے درجہ حرارت کے باعث درجہ حرارت میں اضافہ، گلیشیرز پگھلنے اور گلووف کے خطرات ہو سکتے ہیں۔

رواں سال سردیوں کے دوران شمالی علاقوں میں بارش اور برفباری معمول سے کم رہی، جس کے نتیجے میں جنوری کے آخری اور فروری کے پہلے دو عشروں (1 تا 22 فروری 2026ء کے دوران گلگت بلتستان میں درجہ حرارت نمایاں طور پر زیادہ رہا، ریکارڈ کیا گیا، زیادہ سے زیادہ درجہ حرارت معمول سے 3 تا 5 ڈگری سینٹی گریڈ زیادہ رہا، سب سے زیادہ گلیشیائی جھیلوں میں جمع ہو رہا ہے، جس سے گلیشیائی جھیلوں کے اچانک پھٹنے کے واقعات کا خدشہ بڑھ گیا، محکمہ موسمیات نے اپنی فروری تا اپریل 2026ء کی پیش گوئی میں شمالی پاکستان بشمول گلگت بلتستان اور خیبر میں معمول سے زیادہ درجہ حرارت کا امکان ظاہر کیا ہے۔ ■

وزیر اعلیٰ سندھ نے کراچی ٹرانسپارٹ کمیشن پلان کی منظوری دیدی

تمام اہم منصوبے عالمی معیار کی منصوبہ بندی اور ڈیزائن کے تحت ہونے چاہئیں، مراد علی شاہ

وزیر اعلیٰ سندھ مراد علی شاہ نے فریئر ورکس آرگنائزیشن (ایف ڈبلیو آر) کے گورنمنٹ اور کراچی میٹروپولیٹن کارپوریشن (کے ایم سی) کے مشترکہ اجلاس کی صدارت کرتے ہوئے کراچی ٹرانسپارٹ کمیشن پلان کی منظوری دیدی جس کا مقصد شہر میں پلان کی ترقی کیلئے ایف ڈبلیو آر کے ساتھ شراکت داری قائم کرنا ہے، یہ اجلاس وزیر اعلیٰ ہاؤس

کیلئے 84 ارب 79 کروڑ 60 لاکھ روپے کی ایک مرتبہ کی گرانٹ ان ایڈ کی منظوری دی گئی ہے، میں معیار، رفتار اور شفافیت کو یقینی بنانے کے لیے ایف ڈبلیو آر کے ساتھ شراکت داری میں ترقیاتی منصوبے شروع کرنا چاہتا ہوں، انھوں نے اس بات پر زور دیا کہ تمام میٹروپولیٹن اہم منصوبے عالمی معیار کی منصوبہ بندی اور ڈیزائن کے تحت ہونے چاہیے، ان کا کہنا تھا

اسٹیک ہولڈرز سے مشاورت کے بعد کی گئی ہے، جن کا مقصد ٹریفک جام میں کمی، ہوائی اڈے اور بین الاقوامی رابطوں میں بہتری لائسنس اور صنعتی ٹرانسپورٹ روٹس کو مضبوط بنانا اور شہری انفراسٹرکچر و حسن شہر میں اضافہ ہے، وزیر اعلیٰ سندھ نے فیصلہ کیا کہ ایف ڈبلیو آر کے انجینئرز، محکمہ لوکل گورنمنٹ اور ایم سی کے افسران کے ساتھ مل کر ڈیزائن کو



میں ہوا جس میں صوبائی وزیر بلدیات ناصر حسین شاہ، چیف سیکریٹری سندھ آصف حیدر شاہ و دیگر نے شرکت کی۔

ایف ڈبلیو آر کے وفد کی قیادت ڈائریکٹر جنرل میجر جنرل عبدالسمیع کر رہے تھے، وزیر اعلیٰ نے کہا کہ سندھ حکومت کراچی کے لیے ایک جامع ترقیاتی منصوبہ نافذ کرنے کا ارادہ رکھتی ہے اور شہر میں 523 ترقیاتی اسکیموں

کے کراچی کی ترقی دنیا کے بہترین شہروں کے ہم پلہ ہونی چاہیے۔

اجلاس کو مزید بتایا گیا کہ کراچی کے لیے 84 ارب 79 کروڑ 60 لاکھ روپے کی لاگت سے 523 ترقیاتی اسکیموں پر مشتمل ایک جامع پورٹ فولیو تجویز کیا گیا ہے، میٹرو کراچی مرتضیٰ وہاب نے کہا کہ ان اسکیموں کی نشاندہی فیلڈ ویئر ٹیکنیشن، محکمہ جائزوں اور

سی سی کنڈیکٹر پروگرام تاریخی اقدام، نوجوانوں کو تربیت دلوانے، شہباز شریف

منصوبے کے لیے 4.5 ارب روپے رکھے گئے، مزید وسائل بھی فراہم کریں گے، حکومت کا ڈیجیٹل وژن آگے بڑھایا جائے گا

وزیراعظم شہباز شریف نے سی سی کنڈیکٹر پروگرام کو وقت کی اہم ضرورت اور تاریخی اقدام قرار دیتے ہوئے کہا ہے کہ دنیا میں سی سی کنڈیکٹر کے حوالے سے بے بی ایس کی جنگ جاری ہے، سی سی کنڈیکٹر ز اور منصوبہ بنانے پر عبور حاصل کرنے والی قومیں ہی دنیا کے مستقبل پر حکمرانی کریں گی، سی سی کنڈیکٹر پاکستان کے مستقبل اور نوجوان نسل کا منصوبہ ہے، آئی ٹی، اے آئی اور سی سی کنڈیکٹر جیسے شعبوں میں نوجوانوں کی تربیت ناگزیر ہے، حکومت منصوبے کے لیے مزید وسائل بھی مہیا کرے گی۔

پاکستان میں سی سی کنڈیکٹر کیلئے انسپرائمنٹی ایجوکیشن کے اجرا کی تقریب سے خطاب کرتے ہوئے انھوں نے کہا اللہ تعالیٰ پاکستان کو قدرتی وسائل سے نوازا ہے، ہماری ذمہ داری ہے کہ وسائل سے بھرپور فائدہ اٹھائیں اور قوم کو اس سے آگاہ کریں۔ سرکاری شعبے کے ترقیاتی پروگرام میں سی سی کنڈیکٹر کے منصوبے کیلئے 4.5 ارب روپے رکھے گئے ہیں، یہ ایک آغاز ہے، حکومت منصوبے کیلئے مزید وسائل بھی مہیا کرے گی۔ وزیراعظم نے کہا کہ نوجوان نسل کیلئے دوسرے مختلف پروگراموں پر بھی عمل ہو رہا ہے، پاکستان ڈیجیٹل اتھارٹی قائم ہو چکی ہے، ایف بی آر کو 100 فیصد

SMJ
S. M. JAFFER & CO
SINCE 1989

Baudouin
A WEICH COMPANY

FRENCH TECHNOLOGY
WITH 100 YEARS PROVEN HISTORY

HOSPITAL

Bank

AFTER SALE SERVICES 24/7

RANGE

20-6250KVA

GENSET FROM OEM (SINGLE SOURCE PRODUCT)

SPECIALIZED FOR DATA CENTERS, HOSPITALS, BANKS AND POWER INDUSTRIES

EMISSION COMPLIANT - ENVIRONMENT FRIENDLY
LONG OVERHAULING INTERVAL (UP TO 32000 HOURS)

IMPORTED & LOCAL COUPLED - Both options available

HEAD OFFICE

Jaffer House, 17-Timber Pond, Keamari, Karachi-75620, Pakistan.

BRANCHES

LAHORE | ISLAMABAD | MULTAN | FAISALABAD | QUETTA | HYDERABAD | SUKKUR

SERVICE CENTERS

RAHIM YAR KHAN | KOHAT | JHELUM | CHITRAL | MARDAN | MIRPUR KASHMIR | D. I. KHAN | GAWADAR | PESHAWAR | GILGIT | JACOBABAD | LARKANA | GUJRAT | ABBOTTABAD | SWAT |

info@smjaffer.com | www.smjaffer.com | 111-765-765



AI can flag high-risk motorists before getting on the road, scientists say

Scientists at the University of Sharjah have developed a new machine learning model capable of predicting whether a driver is likely to be involved in an accident before getting behind the wheel. Road accidents are frequently linked to human error, yet traditional driver screening methods, particularly in the taxi and commercial transport sectors, tend to rely heavily on experience and background checks. According to the researchers, these criteria often fall short of predicting who may pose a higher risk on the road.

Their study, published in the journal *Engineering Applications of Artificial Intelligence*, explores a fundamental question: How can we identify risky drivers before they take to the road? To answer that, the researchers developed a data-driven assessment framework combining psychological profiling, physiological monitoring, and simulated driving performance.

Participants began by completing a structured questionnaire measuring personality traits such as sensation-seeking and conscientiousness. They then drove in a highly realistic simulator designed to replicate urban traffic conditions in Dubai, a cosmopolitan city known for its chronic traffic congestion and road network that handles more than 3.5 million vehicles daily.

City car driving simulator software driver's view. Credit: Engineering Applications of Artificial Intelligence (2025). DOI: 10.1016/j.engappai.2025.112585

"During the session, we recorded heart rate and detailed eye-movement indicators, including blink rate

and gaze deviation," said Dr. Malek Masmoudi, the study's lead author and an associate professor of industrial engineering.

"Using machine learning models, we analyzed this integrated dataset to classify drivers as low-risk or high-risk based on objective outcomes such as accidents and traffic violations recorded during the simulation."

Distinguishing between safe and risky drivers

The significance of the work lies in its preventive and developmental approach.

tributes not only to safer roads but also to more structured and evidence-based driver development programs.

"The analysis revealed that gaze distraction, sensation-seeking, conscientiousness, and gender are the best predictors of driving behavior," the scientists note. "The findings suggest that our model can serve as a valuable decision-support tool for taxi companies and transportation agencies aiming to enhance driver selection processes by identifying driv-

ident risks by focusing on highly important factors identified in the study," they write.

Dr. Masmoudi emphasized that road safety should not begin after an accident; it should begin before a driver is hired. "The safest accident is the one that never happens. That's why safety must start before a driver ever touches the steering wheel," he said.

"In the age of Industry 4.0, we have the tools to predict risk instead of just reacting to crashes. The question is no longer, 'How can we

likely to be involved in simulated accidents.

Dr. Masmoudi explained, "Individuals who are naturally disciplined and responsible tend to drive more cautiously. Those who score high in sensation-seeking, meaning they are drawn to excitement and risk, are more likely to exhibit unsafe driving behaviors."

In simple terms, certain measurable personality traits and attention habits consistently indicate a higher risk of accidents. When these factors are analyzed together using machine learning, they

reduced insurance and repair costs, improved passenger safety, stronger public trust, and an overall enhancement of company reputation.

"Risky driving is not random behavior; it reflects measurable patterns in attention and personality," said Imad Alsyouf, professor of industrial engineering at the University of Sharjah and a co-author. "By combining psychology, physiology, and machine learning, we move from intuition-based recruitment to evidence-based safety decisions."

Real-world implications

Prof. Alsyouf emphasized that although their model successfully identifies high-risk drivers, "artificial intelligence should not replace human judgment; it should strengthen it with objective data. Our goal is not only to filter risk, but also to help drivers understand and improve their own safety profile."

Prof. Alsyouf explained that the research was designed with real-world implementation in mind. "Its most immediate application is in taxi and commercial fleet recruitment. Instead of relying solely on driving history or interviews, companies can incorporate a short simulator-based assessment combined with psychological screening and physiological monitoring."

Importantly, the framework extends well beyond hiring. Dr. Masmoudi pointed out that the model could serve as a structured training and evaluation tool,

enabling companies to design personalized improvement programs for drivers.

"The key advantage is that the system operates before deployment," he added, "shifting safety management from a reactive model, responding after incidents occur, to a preventive and developmental one, where risks are identified early and addressed proactively."



Rather than responding to accidents after they occur, the proposed framework allows transportation companies to evaluate risk tendencies before they are deployed.

Beyond supporting safer, more informed hiring decisions, the model can also function as a targeted training tool, helping drivers recognize their risk patterns and enhance their attention and self-regulation. This con-

tributes not only to safer roads but also to more structured and evidence-based driver development programs.

According to the authors, the results validate the practical utility of the proposed classification framework for distinguishing between safe and risky drivers. "The findings provide valuable insights for taxi companies and transportation agencies aiming to enhance driver selection processes by identifying drivers with lower acci-

measure it?" It's: "Why aren't we using it?"

Disciplined and responsible individuals drive cautiously

The findings show that safe driving is not shaped only by technical skills, but it is also strongly influenced by personality traits and patterns of visual attention. For instance, drivers whose gaze frequently strays from the road are significantly more

allow taxi or transport companies to predict risk with a high level of accuracy.

Beyond screening, the study's insights can also inform targeted training programs. Drivers identified as higher risk can receive specialized coaching in attention control, stress management, and safe decision-making.

For taxi companies and fleet operators, this approach could lead to fewer accidents,

New lithium-ion battery design could power longer-lasting electric vehicles and portable devices

A new battery design that could significantly extend the range of electric vehicles and the lifespan of portable electronics has been developed by researchers at the University of Surrey's Advanced Technology Institute (ATI). In a study published in ACS Applied Energy Materials, researchers introduce a novel lithium-ion battery anode that delivers some of the highest energy storage capacities reported for silicon-carbon nanotube systems, while maintaining stability over hundreds of charge cycles.

Lithium-ion batteries power much of modern technology—from smartphones and wearables to electric vehicles. Graphite, the most commonly used anode material, is stable but limited in the amount of energy it can store. Silicon, on the other hand, offers far greater capacity, but it expands during charging, causing it to crack and degrade over time.

To overcome this, the research team developed a new "Vertically Integrated Silicon-Carbon Nanotube"

(VISiCNT) structure. The design grows dense forests of carbon nanotubes directly onto copper foil and coats them with a thin layer of silicon, creating a flexible, conductive scaffold that can

far higher than the graphite (370 mAh/g) used in today's batteries. It also demonstrated improved stability and performance over repeated charge cycles.

offers a practical route to harness silicon's huge storage capability without sacrificing cycle life.

"This is a much-needed breakthrough, delivering

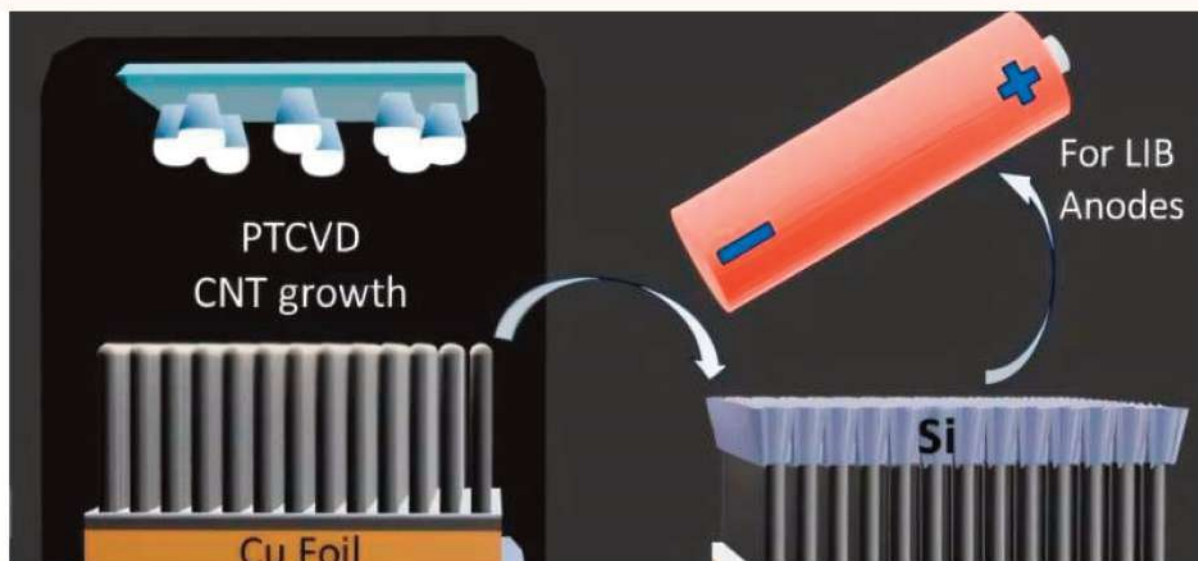
bon nanotubes are grown directly onto copper—the material already used in commercial batteries—using a scalable manufacturing process. This could make it easier to integrate the tech-

turing. We can grow carbon nanotube structures directly onto copper foil at speed and tailor the silicon layer for stability, meaning this approach could be integrated into existing battery production lines with minimal disruption.

"The technology has clear potential not just for electric vehicles, but also for grid storage and smaller batteries used in microelectronics. We are very proud to present yet another CNT technology following our initial research in delivering the world's darkest material, VANTA-Black, via the university spin-out Surrey NanoSystems Ltd., which is showing the real-world impact of fundamental research."

As demand for energy storage grows, batteries will need to store more energy, charge faster and last longer to support the UK's transition to Net Zero. The VISiCNT design offers a promising route to meeting these challenges and could be key to powering next-generation electric vehicles and phones.

- TX



absorb expansion while maintaining performance.

The resulting anode can store a very large amount of energy for its weight. In laboratory tests, it stored more than 3500 milliampere-hours per gram—close to the maximum possible for silicon and

Dr. Muhammad Ahmad, Research Fellow at the University of Surrey's ATI and lead author of the study, said, "There's been a growing push for battery innovation, as many of today's technologies are limited by how much energy batteries can store. Our VISiCNT design

very high capacity, fast charging and long-term durability, while bringing us closer to batteries that can power electric vehicles and everyday devices for much longer on a single charge."

A key advantage of the new approach is that the car-

nology into existing industrial production lines.

Professor Ravi Silva, principal investigator and director of the ATI, said, "This work is an important step towards bringing CNT-silicon anodes out of the lab and into real-world manufac-

Bird-like robots promise greater flexibility and control than drones

A bird banking in a crosswind doesn't rely on spinning blades. Its wings flex, twist and respond instantly to its environment. Engineers at Rutgers University have taken a major step toward building bird-like drones that move the same way, flapping their wings like real birds, using electricity-driven materials instead of conventional electromagnetic motors to power them.

In a study published in Aerospace Science and Technology, aerospace researchers Xin Shan and Onur Bilgen describe a "solid state" bird-like drone, typically referred to as an ornithopter, whose flexible wings flap and twist without motors, gears, or mechanical linkages. Instead, the system relies on the piezoelectric effect, special materials that change shape when voltage is applied.

"We apply electricity to the piezoelectric materials, and they move the surface directly, without extra joints, extra linkages, or motors," said Bilgen, an associate professor in the Department of Mechanical and Aerospace Engineering in the Rutgers School of Engineering.

"The wing is a composite including a piezoelectric material layer and a carbon-fiber layer. Apply voltage to the piezoelectric layer, and the whole composite flexes."

With their bird-like design, ornithopters offer a level of flexibility that makes such drones well suited for future tasks such as search and rescue, environmental monitoring, inspection of hard-to-reach places, and urban package delivery, where aircraft must navigate around buildings, wires, people, and so much

more.

In this computer-generated flight sequence, the ornithopter's wings beat without any gears or motors—powered instead by thin piezoelectric actuators that flex the entire structure. Credit: Bilgen Lab

Modeling the physics of flapping flight

The research team also developed a powerful computer model that connects all the important physics involved in flight at once: wing and body motion, aerodynamics, electrical dynamics, and the control architecture. That allows engineers to test and optimize designs virtually before building physical prototypes, saving time and money while speed-

Bilgen first encountered ornithopters in 2007 while he was a graduate student, but he said his interest deepened in 2013, when he began seriously exploring how flapping-wing flight might be reimaged using smart materials.

Advanced simulation tools developed at Rutgers help engineers optimize bird-like drones in software first, accelerating innovation while reducing the need for repeated prototypes. Credit: Bilgen Lab

Various companies have built experimental bird-like drones, but most existing designs rely on motors, gears, and conventional actuators to drive wing motion.

tion for the work, Bilgen's goal isn't simple imitation.

"We don't want to just mimic nature," he said. "We want to exceed what nature does."

So far, most prototypes of robotic birds rely on mechanisms that imitate bones and muscles. Bilgen's team is taking a simpler path.

"We want to achieve flapping flight without bone-like structures or muscle-like actuators, flapping in a much simpler way," he said.

Instead of motors acting as muscles, thin strips called Macro Fiber Composites (MFCs) are glued directly on their models onto flexible wings. When electricity flows through them, the wings flap, twist and morph.

"The carbon fiber acts like feathers and bone, and the surface-mounted MFCs act like muscles and nerves," Bilgen explained.

Because the system has no gears or joints, the researchers call it a mechanism-free or solid state ornithopter.

Flapping wings offer advantages that spinning propellers found on conventional drones cannot, especially at small scales. "When flapping wings come in contact with the environment, they're less destructive to themselves and to what they contact," Bilgen said.

The use of piezoelectric materials or other smart materials could also improve renewable energy systems.

"A turbine blade is basically a rotating wing," Bilgen said. "We've been looking at applying piezoelectric materials to turbine blades to see if there are aerodynamic benefits."

By subtly changing blade shape in real time, engineers may be able to influence how air flows across the blade surface. That could lead to more efficient wind turbines, he said. - TX



ing development.

"We've scientifically demonstrated that this type of ornithopter can be possible when we make certain material assumptions," he said. "We can show the feasibility of designs that are not yet physically possible."

For now, the primary obstacle is the performance of the piezoelectric material.

"Today's piezoelectric materials are not capable enough," Bilgen said. "However, our mathematical model allows us to look into the future with reasonable assumptions."

Those systems, Bilgen said, struggle to match the performance of natural wings, which flex and respond continuously to changing air.

Learning from nature without copying it Bilgen says nature offers powerful lessons for engineers.

"Things that need to move fast must be lightweight," he said. "That's why bird wings are delicate structures, and aircraft wings mimic bird wings."

While birds and insects provide inspira-