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Victory Day Edition

# SYNERGY

# BANGLADESHI ENGINEERS & ARCHITECTS WORLDWIDE

## Welcome to Synergy Magazine:

## A New Chapter for BEAWorld!

"In the modern industrial era, selecting sustainable electrical process appliances is pivotal for reducing operational costs, conserving energy, and minimizing environmental impact. Achieving these goals requires a strategic approach that combines technical knowledge, adherence to standards, and integration of energy-saving technologies."

**- Engr. Md. Al-Emran Hossain**

Synergy Magazine Index Design or Matrix (December 2024)

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# Editorial Message

Synergy Volume 3 proudly celebrates the spirit of Victory Day on December 16th, commemorating the vivid memories of our triumph in 1971, achieved at the cost of millions of lives. The editorial board honors our heroes with deep reverence, acknowledging their courageous fight for our long-cherished independence. The Liberation War was a people's movement, with engineers playing pivotal roles at various levels of the liberation efforts, even sacrificing their lives for the motherland. As a tribute to their immeasurable contributions, this edition features a documentary highlighting the engineers' crucial roles in the 1971 liberation movement.

While we inherited an independent nation through the sacrifices of our heroes, our land continues to face degradation from pollution and climate change, threatening both lives and livelihoods. Consequently, sustainability has become a paramount issue, aiming to protect people, the planet, and prosperity. Engineers and architects are vital contributors across all sustainability initiatives. In recognition of their importance, this volume includes articles on sustainability relevant to the industrial sector.

Our goal is to reach as many stakeholders as possible with this edition, ensuring our efforts culminate in meaningful results. We extend our heartfelt gratitude to the authors of Synergy for their steadfast partnership and dedication to our journey. We also thank the founder and key organizers of BEAWorld for their unwavering support and inspiration. Lastly, we express our profound appreciation to our readers and viewers of the BEAWORLD website for your continued online engagement.

# বার্তা

প্রিয় প্রকৌশলী / স্থপতিবৃন্দ,

আজ ১৬ ই ডিসেম্বর বাংলাদেশের বিজয় দিবসে মুক্তিযুদ্ধে সকল শহীদ ও মুক্তিযোদ্ধাদের প্রতি জানাচ্ছি অসীম শ্রদ্ধা ও সম্মান। ১৯৭১ সালের এই দিনে দীর্ঘ নয় মাসের রক্তক্ষয়ী যুদ্ধের পর আমাদের চূড়ান্ত বিজয় অর্জিত হয় । ৩০ লক্ষ শহীদের রক্তের বিনিময়ে ও মুক্তিযোদ্ধাদের চূড়ান্ত আত্বত্যাগের বিনিময়ে স্বাধীন বাংলাদেশের অভ্যুদয় হয়। স্বাধীনতা যুদ্ধে শহীদদের এই আত্বত্যাগের প্রতিদান করা আমাদের প্রত্যেকেরই দায়িত্ব। সেজন্য গতানুগতিক দিবস পালন ও আবেগের চেয়ে কার্যকরী উদ্যোগের মাধ্যমে তার প্রতিদান প্রদান বেশী প্রয়োজন বলে মনে করি।

দল, মত, ধর্ম, বর্ণ, লিঙ্গ, ভাষা, অর্থ, প্রতিপত্তি নির্বিশেষে সকল মানুষের সমান অধিকার ও স্বাধীনভাবে মত প্রকাশের গণতান্ত্রিক ও অন্তর্ভুক্তিমূলক (inclusive) বাংলাদেশ গড়ে উঠুক। আসুন বিশ্ব নাগরিক হিসেবে দক্ষতা ও পেশাদারিত্বের মাধ্যমে দেশের সুনাম বৃদ্ধির পাশাপাশি একটি সহনশীল, শান্তিপূর্ণ ও সমৃদ্ধ পৃথিবী গড়ে তোলার ক্ষেত্রে সবাই অঙ্গীকারবদ্ধ হই।

সকলে ভালো থাকুন, সুখী থাকুন।

**Engr. Rezaur Rahman**
Founder & Organiser, BEAWORLD
Bangladeshi Engineers and Architects_Worldwide (BEAWorld)

# Engineers' Role in Liberation War

**Engr. Rafiqul Islam Talukder**
P.Eng, F/3808 (life)

Our Liberation war characterized as Jono-Juddho (War of Common People) of its kind where farmers, students, laborer, professionals, academics, artists, Govt officials, military and para military forces joined. Engineers were one of stakeholders in Liberation war who played vital role for freeing mother land from Pak invaders. With due reverence to millions of martyrs and Freedom Fighters, I will cover in this compartment Engineers role in our Impendence and liberation war.

**Dr. F.R. Khan**

Fazlur R. Khan was born in 1929 in the region of British India known as East Bengal. He received his Bachelor of Civil Engineering degree from Ahsanullah Engineering College (now Bangladesh University of Engineering and Technology).

In 1971 he was working on the design of the 110-story Sears Tower, Chicago along with numerous other projects as general partner and chief structural engineer in the firm. Khan's intense involvement in these efforts was all the more remarkable in light of the new and demanding responsibilities he was assuming at Skidmore, Owings & Merrill (SOM) in this same period. He had just been made a full partner in SOM in 1970.

During Impendence war, in the U.S., the Nixon Administration denied the reality of the situation in East Pakistan and continued to support the military dictator and to send military supplies.

Desperate to effect change in the policies of their governments, individuals organized to form nongovernmental groups that could disseminate information about the plight of the people of East Pakistan. In the U.S, this effort began with East Pakistanis residing around Washington DC and New York. As they worked to establish an organization to assist their homeland, they contacted Fazlur Khan, who was known in the Bengali community by this time, about efforts in the Chicago area.

He agreed to take a central role and became the founding president of two organizations based in Chicago: one, the Bangladesh Emergency Welfare Appeal (BEWA), to appeal for assistance and collect funds for humanitarian purposes; the other, the Bangla Desh Defense League (BDL), to support the emerging defensive forces, the "freedom fighters," and to lobby in Washington DC to end U.S. support for the military government in West Pakistan.


He designated his office at SOM as the official address for both BEWA and BDL. He talked with colleagues about the crisis in East Pakistan and recruited clients and architects to join as founding officers and advisors (among them Stanley Tigerman, William Hartmann, Gerald Hines, John Tishman, and Bernard Weissbourd).

Dr. A.R. Mallick joined a meeting in Khan's home in October 1971. Seated next to Dr. A.R. Mallick are Stanley Tigerman and Dr. Mushfiqur Rahman.

Likewise, his home became a central meeting place for these groups, with people gathering in his living room many weekends. Despair and fear, along with a sense of helplessness, were forefront, as many of the people involved had family and friends in East Pakistan; Khan, as well. His brother, who was teaching that year at the university, had been able to get out of Dhaka but his mother and sister remained. Despite the tension surrounding these meetings, participants were motivated by Khan's ability to create an environment of purposefulness and unity. Ralph Nicholas, one of the many non-Bengalis who devoted great effort to this cause, remembers how Khan's patience overcame the difficulty of bringing together people of far-ranging background, temperament, and personal interests. He was respected as an elder brother, and he "made everyone feel they had a contribution to make."

With the emergency in Bangladesh ended, the organizations abroad that had been created to counter the occupation had no further purpose. The Bangladesh Defense League was dissolved. Members of the Bangladesh Emergency Welfare Appeal, however, believed that a continuing crisis existed, caused by the elimination of educated and professional people, potential leaders of the nascent country; by trauma among survivors; and by malnutrition, causing mental and physical disabilities in young children that would affect the next generation. BEWA's members decided to convert the temporary association into a permanent foundation, named the Bangladesh Foundation, to support efforts such as educational and training programs, small-scale and cottage industries and cooperatives in villages, and the operation of health care facilities.

The Bangladesh Foundation set up a local office in Dhaka to function as a conduit for receiving and funding grant proposals; Muhammad Yunus (who would later found the successful Grameen Bank) returned to Dhaka after completing his graduate studies in the U.S. and became the office's first resident director.

During his trips to Bangladesh in the 1970s Fazlur Khan visited grant applicants and recipients and followed their progress. As one grant recipient, Dr. Zafrullah Chowdhury, recalled years later, Khan's thoughtful consideration and ideas were as much appreciated, and helpful, as the funds the foundation provided.

*On Courtesy "Crisis in Bangladesh," pp. 259 – 265, in Engineering Architecture: The Vision of Fazlur R. Khan*

**Prof. Nurul Ulah**

He was Professor of BUET in EEE department, one of historical figures in our liberation war. Dr. Ula's showed brave act of capturing the harrowing footage of the Jagannath Hall massacre from his residence on the fateful morning of March 26, 1971. Jagannath Hall was one of the genocide spots that was overlooked from his bed room. Amidst such dangers, Dr. Ula daringly filmed the atrocities at Jagannath Hall, his footage later becoming a crucial document of the Liberation War.

Dr. Ula constructed a transmitter in a mere nine days at the behest of Bangabandhu. Moreover, BUET's pivotal role during Bangladesh's Liberation War like clandestine radio transmitter, ingeniously built in a BUET lab, which broadcasted the call for liberation.

***Source: Pressxpress.org***

**Engr. Hasanul Haque inu**

B. Sc. in Chemical Engineering, Bangladesh University of Engineering and Technology-BUET, 1970.

He Played Important Role to organize students in Field Level in Historical Mass Upsurge against Pak Military Junta in 1969, recruited as member of '**Shwadin Bangla Biplobi Parishad**' (Bangladesh Liberation Front), the secret and Key Process for organizing Armed War for National Liberation and Independence in 1969. He led open Military March Past under the banner of '**Martyr Sergeant Jahur Brigade**' on 14th February, 1970 also led open Military March Past under the banner of '**Joi Bangla Bahini**' on 7th June, 1970 at Historical Paltan Maidan of Dhaka. He Hoisted the Flag of Independent Bangladesh formally on behalf of '**United Students Action Council**' for Independence on 23rd March 1971 at Historical Paltan Maidan of Dhaka.

He acted as a role of Camp Commandant and Instructor of Guerrilla Warfare Training Camp of Bangladesh Liberation Front-BLF (popularly known as Mujib Bahini) in exile at Tandua-Deraduhn of India. He trained 10,000 Guerilla Fighters who played key role in liberating occupied Bangladesh from Pak Forces.

*https://amarmp.com/mp/141/biography*

**Engr. Mashroor-ul-Haq Siddiqui, Bir Uttam**

There are 69 freedom fighters who got Bir uttom gallantry, Engr. Mashroor-ul-Haq Siddiqui is one of them. He was popularly known by his nickname 'Komol Siddique.'

After the Liberation War began in 1971, he joined the war as a freedom fighter. Later, he went to India and participated in the administrative work of the Bangladesh government for three months. Afterwards, he joined the armed struggle again.

Towards the end of the Liberation War, Komol was hit by a bullet in his right eye while fighting at Bhatiapara. Poet Abu Zafar Obaidullah wrote a poem titled 'Komoler Chokh' or 'Komol's Eye' following the incident.

Zafar also mentioned his friend Komol in another famous poem titled 'Ami Kingbodontir Kotha Bolchhi'.

Masrur-Ul-Siddique, the son of Z Ahmed and Wazeda Ahmed from Habkhali village in Narail Sadar Upazila, became involved in cultural activities while studying at the engineering university.

He began his career as assistant engineer with the former Water and Power Development Authority (WAPDA) which was later divided into the Water Development Board and the Power Development Board.

Komol was trained in the first Bangladesh War Course and participated in guerrilla warfare in Jashore, Narail and Faridpur.

He proved his bravery in the Boira sub-sector raid, ambush and guerrilla warfare under sector No. 8. His strategy led the Mukti Bahini to defeat the Pakistani forces at the battle in Narail's Nabagangar Paar. He was the first to hoist the Bangladesh flag in Narail on Dec 7.
Bangladesh was freed on Dec 16, but the Pakistani forces in Gopalganj's Bhatiapara had yet to surrender. Under the orders of Sector Commander Abul Manzur, Komol Siddique went to free Bhatiapara.

On Dec 18 or 19, amid the fighting, he was hit by a bullet in the eye. The Pakistani forces there surrendered on that day. "It was much safer not to fight. But I promised to fight," Komol said in an interview later.

After independence, he was honoured with the Bir Uttom title by the government of Bangladesh.
He leaves behind his wife Syeda Rokeya Siddique and two daughters.

***On Courtesy bdnews24.com***

**General Engr. Mustafizur Rahman, Bir Bikrom**

General Mustafiz graduated from Ahsanullah University (Presently, Bangladesh University of Engineering Technology) in 1962. He initially joined the Pakistan Air Force in 1962 as an Airman in the Air Traffic Control trade. He was commissioned in the Pakistan Army through the Army War Course program for enlisted personnel in 1966 in the Corps of Engineers as Second Lieutenant from Pakistan Military Academy, Kakul. From 1966 to 1969 he served as Lieutenant in Sapper unit in Chilas.

The then Captain Mustafiz fought valiantly in Bangladesh Liberation War, 1971 as sub sector Commander in Jessore sector. During Liberation War he was wounded in November 1971 and received gallantry award "Bir Bikrom" by the Government of People's Republic of Bangladesh. He was promoted to the rank of Major during the liberation war.

He served as Chief of Army Staff of Bangladesh Army from December 1997-December 2000. He was the first General of Bangladesh Army.

***On courtesy: Wikipedia***

**Engr. Shamsul Islam Muhammad Nurunnabi Khan, Bir Bikrom**

Engr. Shamsul Islam Muhammad Nurunnabi Khan was a freedom fighter and writer. He was awarded Bir Bikrom for his contribution to the Liberation War of Bangladesh.

**Early life and education**

Nurunnabi Khan was born in 1942, into a Bengali Muslim family in the village of Lakshmidharpara, Ramganj, Noakhali District, Bengal Presidency (now in Lakshmipur District, Bangladesh). He was the eldest child of Habibullah Khan and Shamsunnahar Begum.

Engr. Khan completed his graduation from East Pakistan University of Engineering and Technology (now Bangladesh University of Engineering and Technology) in electrical and electronics engineering. He was the president of East Pakistan University of Engineering and Technology Student League in 1967 and 1968. Later, he became vice president of his university's student union in 1969.[2] He took part in the 1969 Mass Uprising.[3]

**Career**

After completing graduation Nurunnabi Khan joined the Pakistan Army. He was in Quetta School of Infantry and Tactics in 1971. After the declaration of independence of Bangladesh he decided to take part in the Liberation War of Bangladesh. He came to Dhaka on 27 March 1971 to take part in the Liberation War of Bangladesh.[4] He was appointed the captain of Delta Company in the Liberation War of Bangladesh.

Nurunnabi Khan took part in battles across the country. He took part in the battlefield of Bahadurabad, Chhatak, Gowainghat, Radhanagar, Chhotokhel, Salutikor and other places.[4] After independence he was awarded Bir Bikrom for his contribution to the Bangladesh Liberation War in 1971.

Engr. Nurunnabi Khan joined Bangladesh Army after the Liberation of Bangladesh. He studied in Royal Military College of Science from 1973 to 1976 and achieved a degree in atomic engineering.

Nurunnabi Khan also wrote books about the Liberation of Bangladesh. His twelve books were published. He wrote books like Jiboner Juddho Juddher Jibon, Roumari Ronangon, Operation Bahadurabad and Operation Salutikor. He also established Columbia Prakashani for publishing books about the Liberation War of Bangladesh. Nurunnabi Khan died on 22 May 2019 at the age of 77.

***On courtesy: Wikipedia***

**Capt. Engr. Ishaque, Bir Protik**

Capt. Ishaque was born in Jessore district in late '40s. He got his Chemical Engineering degree from EPUET (currently BUET) in 1970. He joined Karanafuli Paper Mills (KPM), Chandraghona, finally retired as Director -Technical & engineering from BCIC.

**Role in the Liberation War**

On the night of March 25, the Pakistan Army started killing in Dhaka and Chittagong, and the news reached Chandraghona, a remote area of the country, on March 26. Before March 25, a struggle committee and a volunteer force of students and youths were formed there under his leadership.

Later AKM Ishaq then crossed the border to India. They set up camp in a hilly area called Harina, seven kilometers southwest of Sabrum. Later that camp became the headquarters of Sector 1. He second phase of the program began there. In July, AKM Ishaq was appointed quartermaster of Sector No.1 from Mukti Bahini headquarters. After receiving this responsibility, he collected fighters for the liberation army, training them, providing food and lodging, etc., were accomplished skillfully within considerable limitations.

AKM Ishaq distributed various weapons among trained volunteers on March 26. Then on March 27, he met Mahfuzur Rahman (Vir Bikram), the leader of the freedom fighters stationed at Madana Ghat in Kaptai, and joined the resistance war.

Ishaq with his group of volunteers took up position between Madna Ghat and Chittagong University. In April he took direct part in several battles. When Kalurghat fell on April 13, he gathered with his party at Khagrachari.

It was decided in the discussion that the freedom fighters under the overall command of Mir Shaukat Ali (Bir Uttam) would resist the Pakistan Army in the Rangamati-Barkal and Rangamati-Chittagram road areas by taking a position in Mahalchari. AKM Ishaq was tasked with resisting the Pakistani troops on the Rangamati-Chittagong road.

He ambushed several times with his team on the Rangamati-Chittagong road. Several Pakistani soldiers were killed in this ambush. On April 27, a face-off took place in Mahalchhari between the commando team of the Pakistan Army and their allied armed Mizos. Aftabul Quader (Bir Uttam) of Mukti Bahini and some freedom fighters were martyred in this terrible war. AKM Ishaq and his team's freedom fighters showed great skill in the battle on this day. They managed to kill many of the armed Mizos allied to the Pakistani army. However, they could not survive there. Because the Pakistani army and the armed Mizos were outnumbered. Later they settled in Ramgarh. A fierce battle took place there on May 2. The freedom fighters tried hard but failed to hold Ramgarh. The first phase of AKM Ishaq's liberation war ended with the fall of Ramgarh.

The Bangladesh government awarded him the title of Bir Pratik for his bravery in the war of independence.

***On courtesy: Wikipedia***

**Martyr Engineers:**
We find 27 martyrs Engineers as listed below who sacrificed their lives for the sake of independence, with due reverence I would like to mention their names:

| | |
|---|---|
| Martyr Engr. Nazrul Islam | Martyr Engr. Lt. Cdr. Moazzem Hossain |
| Martyr Engr.Mohammad Shamsuzzaman | Martyr Engr. Abul Kalam Mohammad |
| Martyr Engr. Mohammad Nur Hossain | Martyr Engr. Altaf Hossain |
| Martyr Engr. Shamsuzzaman | Martyr Engr. Mozammel Haq Chowdhury |
| Martyr Engr. Mohammad Shofiqul Anwar | Martyr Engr. Mozammel Haq |
| Martyr Engr. Mahmud Hossain Akand | Martyr Engr. Sekandar Hayat Chowdhury |
| Martyr Engr. Lt. Col. Mohammad Abdul Kadir | Martyr Engr. Abu saleh |
| Martyr Engr. Badsha Alam Shikdar | Martyr Engr. Ahmedur Rahman |
| Martyr Engr. Faruk Ahmed | Martyr Engr. Mozammel Ali |
| Martyr Engr. Prashant Pal | Martyr Engr. A. k. m Nurul Haq |
| Martyr Engr. Md. Golam Sarwar | Martyr Engr. Md. Fazlur Rahman |
| Martyr Engr. Afsar Hossain | Martyr Engr. Golam Nabi Satu |
| Martyr Engr. Chowdhury Ebadul Haq | Martyr Engr Ahsan Ul Habib |
| Martyr Engr. Shams ul Huda | |

*I will just try to draw out few martyrs' history from readily available sources, I do apologize not to place all martyrs to this list due to unavailability of sources and time limitation as well.*

**Martyr Engr. Nazrul Islam**
In July 1971, he went to Agartala and was appointed as an adviser for electrical and power matters to the then-newly formed Bangladesh government. During the Liberation War, he conducted an operation to blow up five power stations in Dhaka. He met his martyrdom on September 18, 1971.

After the Independence of the nation, the Hatkhola road was officially named after him and Shaheed Nazrul Girls School was established in his own district Shariatpur run by his wife Professor Hazera Nazrul.

***On Courtesy: Dhaka Tribune***

**Martyr Engr. Mohammad Shamsuzzaman**
Shamsuzzaman, Mohammad (1926-1971) engineer, martyr intellectual. He was born on 28 Bhadra 1333 (1926 AD) at village Madhyanagar in Raipur thana of Narsingdi district. His father was Tayebuddin Ahmad. Mohammad Shamsuzzaman passed Matriculation examination in 1943 from Comilla Zila School and ISc in 1945 from Pabna Edward College. He obtained his degree in Civil Engineering in 1950 from Shibpur Engineering College in Kolkata.

Mohammad Shamsuzzaman began his career as Assistant Engineer in the Department of Irrigation in Chandpur. He joined as Assistant Engineer in 1954 under the Chittagong Port Authority. He got higher education on Hydraulic Engineering in England in 1960. On his return from England he joined his post at Chittagong Port. He was elevated to the position of Chief Engineer of Chittagong Port Authority in 1964.

During the non-cooperation movement in March 1971 he supported the cause of the Bangali labour and employees resisting the unloading of arms from the Pakistani ship 'Swat' at Chittagong port on 24 March. After the recovery of Chittagong by the Pakistan army at the second stage of operation searchlight, the personnels of Pakistan Navy arrested Mohammad Shamsuzzaman on 21 May from the port. Thereafter he could not be traced. [ATM Zayed Hossain]

***On Courtesy: Banglapedia***

**Martyr Engr. Noor Hossain**

Martyr Engr. Noor Hossain (1934-1971) engineer, martyr intellectual. He was born on 23 April at village Bathua near Noju Mia Hat in Hathazari thana of Chittagong district. His father was Alhaj Zaker Hossain and mother Alhaj Mabia Khatun. Noor Hossain passed Matriculation examination in 1951 from Chittagong Government Muslim High School and ISc in 1953 from Chittagong Government College. He obtained his degree in Civil Engineering in 1957 from Ahsan Ullah Engineering College (currently BUET) and stood first class third position.

Engr. Noor Hossain began his career in Kaptai Hydro Plant construction Project. Later he joined Chittagong port Authority as Assistant Engineer in 1959. In parallel to service, he got LL. B degree in 1966.

He always used to nurture and uphold Bengali culture and protest colonial mentality of communal Pakistan regime. In parallel to professional responsibility, he used to support and engage himself in the independence movement uprising in mid-sixties like six-point movement, ’69 mass movement and ’70 election and got connected to Awami League leaders. His pro-liberation position was not taken easily by non-Bengali Port chairman and some staff. He was inhabitant of 30 no. bungalow of officers’ quarters where he came under surveillance of collaborators. He used to pass on information to Chittagong radio through his brother Fazal Hossain.

Meanwhile, 21$^{st}$ May 1971, his Chief Engineer Shamsuzzaman got missing that caused him distracted and panic. On 22$^{nd}$ May Saturday, he moved out of his quarters in search of his senior Engr. Shamsuzzaman and visited Engr Zaman house to meet his family. By this time, he advised his associates to join liberation war. On way to his office from Engr. Shamsuzzaman house, he was abducted by Pak Army along with his driver Abul Kalam near Dewan Hat. Afterwards his car was found closed condition in front of Ali Engineering Workshop near Batali Road.

Moreover, author of this article and the then Honorary Secretary of IEB Rangadia Center played pioneering role, in commemorating his memory “Shaheed Engineer Noor Hossain Road” was bult from Marine Academy to Parki Beah in Ranagadia, Anwara in 1998 to mark Golden Jubilee of IEB. The then LGED Chief Engineer, Late Engr Quamrul Islam Siddique who was also a valiant freedom fighter extended his full support.

***On Courtesy: Engineering News***

**Martyr Shafi Imam Rumi: BUET Student**

Quote

We are fighting a just war. We shall win. Pray for us all. I don't know what to write... there is so much to write about. But every tale of atrocity you hear, every picture of the terrible destruction that you see is true. They have torn into us with a savagery unparalleled in human history. And sure, as Newton was right, so

shall we too tear into them with like ferocity. Already our war advanced. When the monsoons come, we shall intensify our operation. Unquote
—Shafi Imam Rumi in a letter to Syed Mostofa Kamal Pasha [3]

Shafi Imam Rumi (29 March 1951 – 30 September 1971) was a guerrilla fighter of the Bangladesh Liberation War. He was the eldest son of Jahanara Imam. In her memoir about the war, Ekattorer Dingulee, Rumi was the main character. Rumi was murdered by the Pakistani Army.

**Early life**

Rumi was born on 29 March 1951 in the higher middle-class family of Jahanara and Sharif Imam. He started his education at a local kindergarten school in Azimpur. Rumi passed his matriculation from Adamjee Cantonment Public School & College in 1968. He stood third in the Pakistan Education Board. During his college days, Rumi joined the University Officers Training Corps along with his friends. He was later promoted to the rank of Sergeant. By March 1971, he completed his H.S.C. and got admitted in Engineering College[1] (currently BUET). He was also enrolled into Illinois Institute of Technology, but did not attend due to the war.

**Bangladesh Liberation War**

During the earlier part of the war, Rumi constantly attempted to convince his mother for giving him the permission to attend the war. As his mother finally agreed on 19 April 1971, Rumi compiled his first attempt to cross the border to India on 2 May. But he had to come back for adverse situation and became successful in his second try. He took training for the war in Melaghar, Agartala under Sector-2. It was the sector supervised by Khaled Mosharraf and Rashid Haider. After his training, he came to Dhaka to join the Crack Platoon, a group that conducted major guerrilla operations against the Pakistan Army. His major target was to bomb the Siddhirganj Power Station. Rumi participated in hit and run attacks, including the shooting of police guards outside a house Dhanmondi Road 18 that led to his capture, detention and demise.[6] In the Dhanmondi operation, Rumi and his friends carried out a successful assault on the Pakistanis, shooting and killing soldiers from the back window of a black Morris Oxford and then giving the pursuers the slip. The whole street of Dhanmondi gentry celebrated it.

**Arrest by Pakistan Army and aftermath**

After his operation, he became an icon to his fellow warriors. He stayed the night of 29 August 1971 to his house, the night when Pakistan Army caught most of the guerrilla fighters based on their information from an unknown source. His father, younger brother and a cousin were also arrested with him by the Pakistan Army, led by Captain Quayyum. They were first taken to the intersect of Mirpur Road and Elephant road. There they were lined up in front of a military jeep and intelligence officers identified each of them by throwing headlights on the faces. Among all, Rumi was separated and took to a military vehicle while Sharif with other arrested family members got in their family car. Sharif himself was driving and was accompanied by two armed military personnel, was following the military convoy. Later, Rumi told to his father in detention that in that vehicle Rumi was accompanied by almost all the freedom fighters, he fought with days prior to the arrest. However, from Elephant Road they were taken to Ramna Police Station where a new series of identification took place. From there the military convoy headed to Dhaka Cantonment, this time too, Sharif was driving as a part of the convoy though was one of the detainees. In Dhaka Cantonment, Army tortured both Rumi and others seriously and kept them in a small room somewhere near or inside a hostel in the cantonment. There they were accompanied by many other victims of that night including artist Altaf Mahmud, Abul Barak and Rumi's colleague Azad, Jewel and others. In that room, Rumi explained to his

brother Jami, that army already are fully aware of his operations and he and his colleague Bodi took the full responsibly of the attacks. He advised Sharif and Jami to give the same statements and to tell the army that the family (of Rumi) were completely unaware of his activities.

Rumi's cousin, who was arrested with them, was freed on 2 September 1971 reportedly because he was able to show a bus ticket which incidentally was in his pocket and proved him not be a permanent resident of Rumi's residence. Sharif, Jami were cut loose two days later on 4 September. They returned with harrowing tales of torture. Sharif, exhausted from tiredness and injured from severe torture, drove his car to his Elephant Road residence. Rumi with others of his co-fighters Bodi, Jewel and others, were later never found, assumably became one of the hundreds of thousands of people massacred by the military junta. Some sources claim that a number of arrested freedom fighters were executed at midnight of 4 September and Rumi had been one of them. Among the captured, Chullu, one of Rumi's valiant co-fighters, was confined in the Central Jail of Dhaka, from where he was rescued by a group of sector-2 freedom fighters after the allied forces occupied Dhaka on 16 December.

As Rumi along with his co-fighters had been acting as the key masterminds of Dhaka metropolitan oriented guerrilla warfare to that date and among them almost all then staying in Dhaka were captured on days around 29 August, the crackdown appeared as a temporary halt to Mukti Bahini operations in Dhaka. Later, though the Sector 2 commander Maj. Khaled Mosharraf had to largely curtail his Dhaka supplies because of intensifying frontier conflicts, by the end of September, the capital again started being shaken by frequent guerrilla attacks on military units and bombing on key locations, and this time it continued almost up to the Pakistani surrender in December later that year.

As Yahya Khan was set to announce mass mercy on 5 September 1971, many family relatives instated to ask mercy petition for Rumi to the government. Rumi's parents took the suggestion and thought over it but later decided to not do so because they considered it to be a dishonor to Rumi's views and ideology.

***On Courtesy: Wikipedia***

**Lt Commander Martyr Engr. Moazzem**

Hossain, Lt Commander Moazzem (1933-1971) naval officer, martyr freedom fighter. He was born on 2 Aswin 1339 BS (1933 AD) at village Dumuritala in Pirojpur district. His father Mofazzel Ali was a government official and his mother was Latifunnesa Begum. Moazzem Hossain passed Matriculation examination in 1947 from Kachua High School. He got himself admitted in ISC class in Bagerhat College. His education became irregular due to his association with radical student movement. Later he studied in ISC class at Brajamohan College, Barisal.

**Lt Commander Moazzem Hossain**

In 1950, while a student in Brajamohan College, Moazzem Hossain joined Pakistan Navy. The same year he received training in British Royal Navy. He was then regularly commissioned in the Pakistan Navy. As an officer of the Pakistan Navy, he obtained the degree on Mechanical Engineering and Marine Engineering from British Institute of Mechanical Engineering and British Institute of Marine Engineering in 1958-1960. He was appointed as chief engineer in Chittagong Naval Base in 1966. In 1967, Moazzem Hossain was promoted to the rank of Lieutenant Commander. Later on, he joined in the Barisal branch of East Pakistan Inland Water Transport Authority on deputation.

On 9 December 1967, a team of Military Intelligence Branch arrested Moazzem Hossain under Defense of Pakistan Rule. In 1968, under the amended Code of Criminal Procedure the government formed a special tribunal and instituted a sedition case as State versus Sheikh Mujibur Rahman and Others, which came to be

known as Agartala conspiracy case. Out of 35 accused in the case, Lieutenant Commander Moazzem Hossain was the second in the list. Moazzem Hossain was accused of organizing the Bangali personnel of Pakistan Navy for an insurrection for making East Pakistan independent. He was accused of perusing his venture from 1964. He was said to have motivated many other East Pakistani officers in the army and air force to his cause.

He was alleged to have held secret meetings with sheikh Mujibur Rahman, and also with many civil service and armed forces members. However, In the face of vigorous and non-stop mass movement the government was compelled to withdraw Agartala Conspiracy Case on 22 February 1969. After his release Moazzem Hossain joined his service and retired on 18 March 1970.

After retirement from service, Moazzem Hossain' joined politics. On 24 March 1970 he declared a movement for establishing an independent sovereign state on the basis of historic Lahore Resolution. With this end in view, he formed the Lahore Prostab Bastabayan Committee on 28 March 1970. He wrote some booklets which include Lahore Prostab Bastobayan, Ek Dafa. Moazzem Hossain turned the Lahore Prostab Bastobayan Committee into a nationalist political party on 21 February 1971. During the noncooperation movement in March 1971 he tried to persuade Bangabandhu Sheikh Mujibur Rahman to organize an armed struggle against Pakistan. He directed his political workers for taking military training. From 16 to 22 March Moazzem Hossain travelled many districts for mobilizing public opinion in his favour. A group of Pak army under Colonel Taj encroached upon his residence in Dhaka in the morning of 26 March 1971 and shot him dead.

In memory of Lieutenant Commander Moazzem Hossain, the training centre of Bangladesh Navy at Rangamati was named as BNS Shaheed Moazzem on 16 January 1976. The Postal Department of the Government of Bangladesh issued commemorative postal stamp in his name on the Martyred Intellectual Day on 14 December 1993. Dhaka City Corporation named a road of the city as Shaheed Lieutenant Commander Moazzem Hossain Sarak. [ATM Zayed Hossain]

***On Courtesy: Banglapedia***

**Martyr Engr. Badsha Alam Sikder**

Badsha Alam Sikder was born in Lakarta village of Shariyatpur zilla in 1941. He passed matriculation from Jubilee School of Patuakhali with first division. After passing ISC from BM College in Barisal, he got enrolled in BUET. He passed civil engineering with excellent academic results. As a person, he was very innocent, polite and honest. His father, with his limited income, from a government job had educated all his children well(Shot shikhkha). To get Badsha admitted to BUET, his father Abdur Razzak Sikder had to mortgage the piece of land he had in the village. As it became harder for him to bear the educational expenses of all his children, he arranged for Badsha's marriage to someone from a well-off family, thinking that the family would bear his educational cost. Badsha Alam told his father that he didn't want to get married because he didn't want to stay away from his family, that he would bear his own educational expenses by becoming a private tutor and urged his father to take care of his siblings' education instead. He assured his father that after finishing his study he would pay for his siblings' education and also get back the land that his father had mortgaged. He wanted to give his father some relief and his mother some peace in life.

After obtaining the engineering degree, he joined the then C&B (currently split into PWD & Roads & Highway). When the Liberation War started, he was working in Gaibandha as a divisional engineer. During that time, his daughter was born. In his diary he used to write about the war and the joy of becoming a father. He wrote, “the girl who was born in juddher rokto gaye mekhe jar jonmo, juddher gondho jar shorire, that war would end, Bangladesh would be liberated.” He dreamt that his daughter would see a free country and wave the red-green flag against the open sky, she would say, “Baba (father), I am free.” But before his little

daughter could call him “baba,” on April 25, the Pakistan army picked him up from his home blindfolded. They killed him and his cook brutally along with many other intellectuals under the Rangpur bridge. His dead body was never found.

Badsha Alam was put under surveillance since the time he used to help the freedom fighters. He used to help freedom fighters secretly -- with money, arms and other important things. And when he was taking preparation to actively join the Liberation War, the then civil SDO got the Pakistan army to raid his house. They confiscated some written documents and firearms, among other things, from his house.

His father had to suffer brutal torture at the hand of the Pakistan army because of his sons' involvement in the war. The Pakistan army tortured his father saying, “Bengalis are all Hindus. Why have you joined the Hindus being Muslims yourselves? Why do you eat with your hands, can't you use forks?”
*On Courtesy:* ***Smriti: 1971, Vol. IV, Bangla Academy****, 1991 The Daily Star*

**Conclusion**
Engineers destroyed many infrastructures what they built. They would know **“Every act of creation begins with an act of Destruction” -Pablo Picasso**. After the war and conquering Victory, Engineers and Architect engaged themselves in building the new born country since re-construction, continued thereafter in building modern and prosperous Bangladesh which is visible to all of us.

I admit that still many more names remain outside the coverage to this article due to author limitation. I do apologize for my incapacity. In future, this endeavor will continue subject to gathering of sources of information. Our independence movement and liberation war formed a huge canvass like an ocean. I tried to pick up a droplet of water out of that ocean.

**Disclaimers:** *This article is nothing but a fraction of history during 1952-1971 guided by events where many parties, characters and figures came across. I tried my best to put up references against my illustration where it applies. Even though it may leave behind some unintentional errors and omission, I do apologize in advance for that. This article does not hold liability of parties, characters and figure’s role whatsoever after 1971.*

# Integrating Sustainability in Industrial Factory Building (RMG) and Equipment Selection

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Bangladesh's future Ready-Made Garment (RMG) factories are poised to become global epitomes of sustainability, integrating eco-friendly designs with innovative technologies for a greener tomorrow. These factories will transform the industrial landscape and showcase how sustainable practices can drive economic growth while minimizing environmental impact.

## Sustainability

Sustainability in the design of Bangladeshi RMG factories emphasizes the use of environmentally responsible materials and processes. The factories are designed to minimize their carbon footprint by incorporating renewable energy sources like solar panels and wind turbines, which reduce dependence on fossil fuels and decrease greenhouse gas emissions. Additionally, these facilities integrate water recycling systems to conserve water, addressing one of the major environmental challenges in textile production. By aligning with international sustainability guidelines and certifications, such as LEED, EDGE, WELL, and ISO standards, these factories demonstrate a commitment to environmental stewardship.

## Sustainability Standards Required for RMG and Textile Factories

### 1. Environmental Standards

These standards focus on reducing environmental impact and promoting green practices:

- **ISO 14001 (Environmental Management Systems)**
  - Provides a framework for identifying, managing, and mitigating environmental risks.
  - Encourages waste reduction, resource efficiency, and pollution control.
- **LEED (Leadership in Energy and Environmental Design)**
  - Certifies buildings based on energy efficiency, water conservation, and sustainable construction materials.
- **BREEAM (Building Research Establishment Environmental Assessment Method)**
  - Evaluate building sustainability, emphasizing life cycle impacts, carbon emissions, and energy use.
- **GHG Protocol (Greenhouse Gas Protocol)**
  - Establishes standards for measuring and managing greenhouse gas emissions.
- **BNBC 2020 (Bangladesh National Building Code)**
  - Mandates structural and fire safety for textile and RMG factories in Bangladesh.
- **BUILDING ENERGY EFFICIENCY & ENVIRONMENT RATING (BEEER-2020)**
  - BEEER is a framework or system designed to evaluate and rate buildings based on their energy efficiency, environmental impact, and overall sustainability performance.

**2. Energy Standards**

Energy-focused standards and practices ensure efficient use of resources:

- **ASHRAE Standards (e.g., ASHRAE 90.1)**
  - Guides energy-efficient building designs, HVAC systems, and lighting.
- **ISO 50001 (Energy Management Systems)**
  - Provides a framework for improving energy performance, reducing consumption, and increasing renewable energy use.
- **IE4/IE5 Motor Standards**
  - Promotes using high-efficiency motors in industrial processes to reduce electricity consumption.


**3. Water Conservation Standards**

Standards that emphasize efficient water use and management:

- **WaterSense (EPA Program)**
  - Certifies water-efficient products and systems.
- **ISO 14046 (Water Footprint)**
  - Measures and reports on water usage throughout production cycles.

**4. Waste Management Standards**

Focused on reducing, reusing, and recycling waste:

- **Zero Waste to Landfill Certification**
  - Recognizes facilities that divert all waste from landfills.
- **ISO 21930 (Sustainability in Building Construction)**
  - Provides a framework for managing construction and operational waste sustainably.

**5. Worker Health and Safety Standards**

Ensures employee well-being in sustainable environments:

- **ISO 45001 (Occupational Health and Safety)**
  - Set requirements for workplace safety and reducing occupational hazards.
- **WELL Building Standard**
  - Certifies spaces that promote health, comfort, and well-being.
- **NFPA 101 (Life Safety Code)**
  - Ensures safe building design for fire safety and emergency evacuation.
- **ILO Core Conventions**
  - Set labor standards, including child labor prohibition, collective bargaining, and workplace safety.


**6. Social Responsibility Standards**

Standards that guide ethical and community-focused practices:

- **Fair Trade Certification**
  - Supports ethical labor practices and fair wages.
- **Global Reporting Initiative (GRI)**
  - Framework for sustainability reporting on environmental, economic, and social impacts.

**7. Product-Specific Standards**

For sustainable production processes and materials:

- **Oeko-Tex Standard 100**
  - Certifies textiles free from harmful substances.
- **Cradle-to-Cradle Certification**
  - Promotes products designed for a circular economy with sustainable materials and processes.

**8. Industry-Specific Standards**

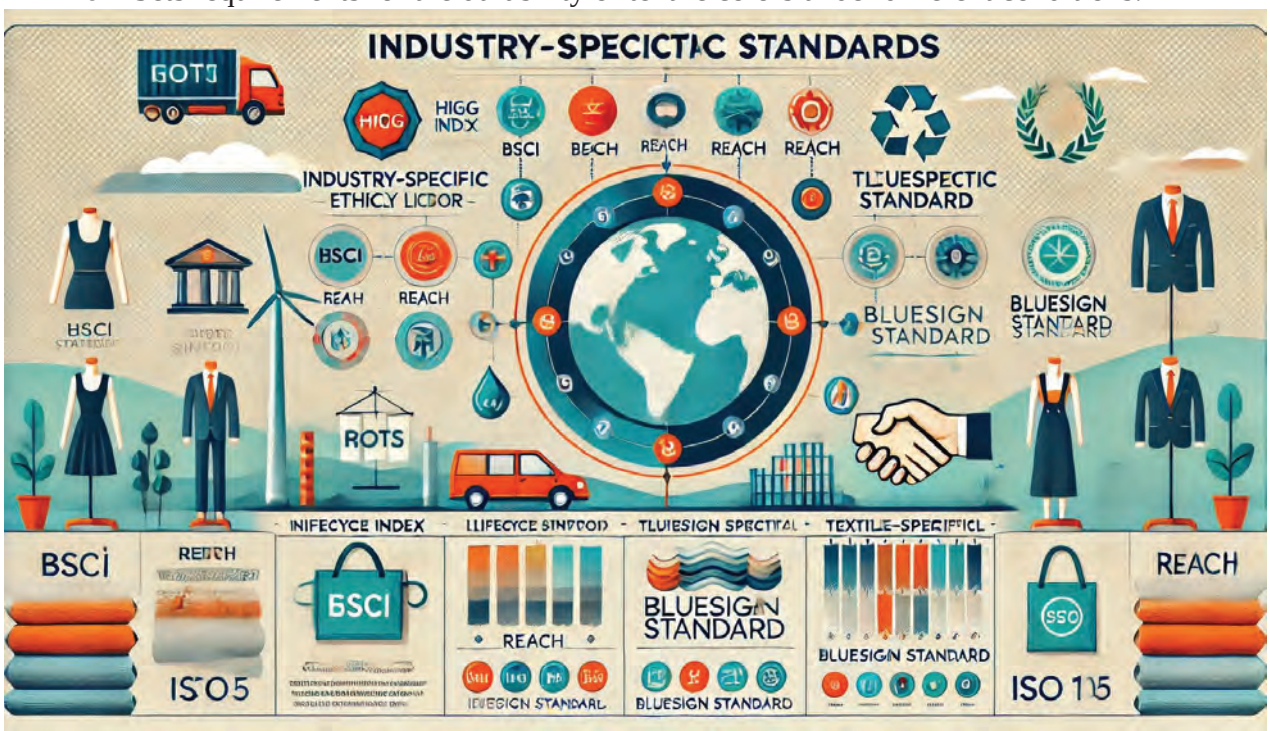
Tailored for specific sectors like garments, electronics, or construction:

- **Higg Index (Apparel and Footwear Industry)**
  - Assesses sustainability impacts across a product's life cycle.
- **Global Organic Textile Standard (GOTS)**
  - Certifies organic textiles with sustainable processing standards.

**9. Textile-Specific Standards**

For sustainable production and global market acceptance:

- **BSCI (Business Social Compliance Initiative)**
  - Addresses labor and environmental issues in the supply chain.
- **REACH (Registration, Evaluation, Authorization, and Restriction of Chemicals)**
  - Governs the use of chemicals in textiles within the European market.
- **Bluesign Standard**
  - Ensures sustainable textile production by managing inputs and resources responsibly.
- **ISO 105 (Textiles—Colourfastness)**
  - Sets requirements for the durability of textile colors under different conditions.




**10. Compliance Standards for Trade and Export**

Mandatory for exporting products to global markets:

- **Customs-Trade Partnership Against Terrorism (C-TPAT)**
  - Ensures secure supply chains for exports to the United States.
- **SEDEX (Supplier Ethical Data Exchange)**
  - Facilitates ethical trade and supply chain transparency.
- **Global Recycled Standard (GRS)**
  - Verifies recycled content in products and responsible production practices.


**11. Chemical Safety Standards**

To manage and minimize hazardous substances in production:

- ISO 14001 (Environmental Management)
  - Provides a framework for managing chemicals responsibly.
- ZDHC (Zero Discharge of Hazardous Chemicals)
  - Eliminates hazardous chemicals and ensures safe chemical management.

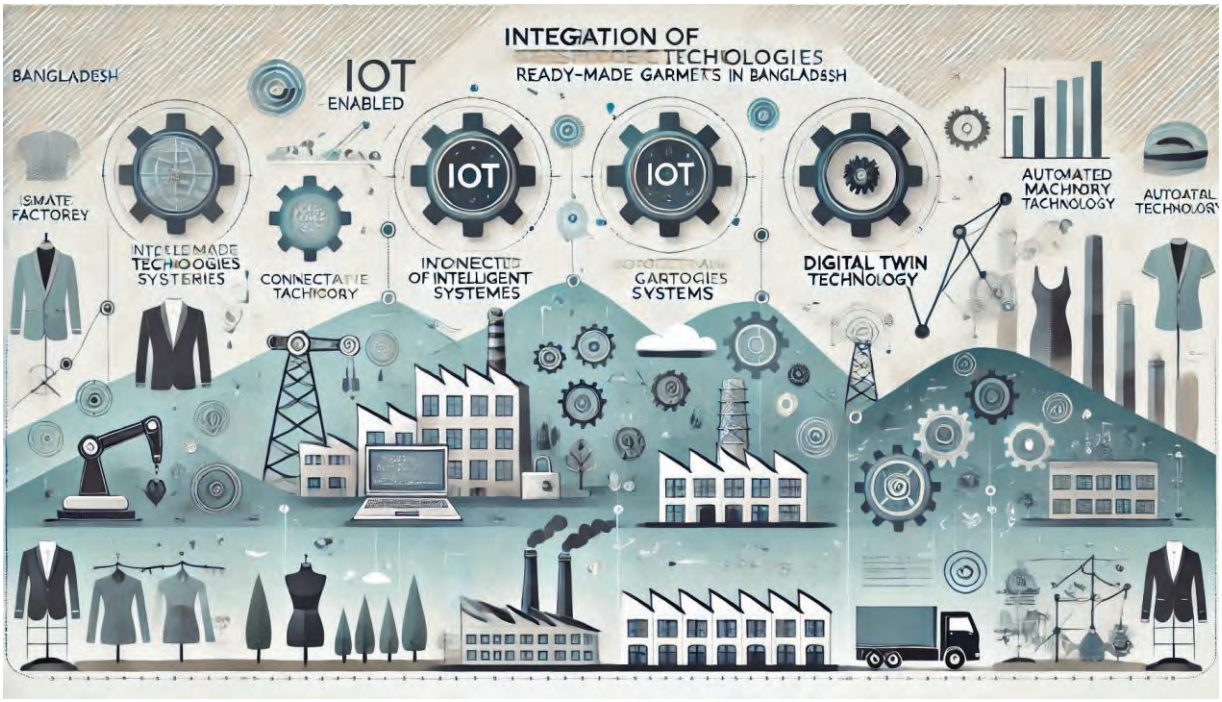
**12. Social and Ethical Standards**

Standards that safeguard workers' rights and ethical practices:

- SA8000 (Social Accountability Standard)
  - Focuses on worker health, safety, fair wages, and ethical labor practices.
- Fair Trade Certification
  - Ensures equitable trading relationships, fair wages, and community development.
- Ethical Trading Initiative (ETI)
  - Promotes ethical sourcing and fair treatment of workers.

**Smart Systems**

Smart systems are integral to the advancement of Ready-Made Garment (RMG) factories in Bangladesh, offering comprehensive solutions to optimize processes and enhance operational efficiency. By incorporating intelligent technologies, these factories can significantly improve productivity while aligning with global sustainability and ethical standards.




**Integration of Intelligent Technologies**

Smart systems form the backbone of future-proof RMG factories, enabling real-time monitoring and operational optimization. The deployment of IoT-enabled monitoring systems plays a crucial role in tracking energy, water, and material usage. These systems enhance resource management by providing detailed insights into consumption patterns, enabling factories to minimize waste and improve sustainability.

Automated machinery, such as cutting, sewing, and finishing equipment, optimizes efficiency and precision in production, reducing manual intervention and operational errors Furthermore, digital twin technology offers virtual replicas of facilities to simulate and predict production processes, providing insights to improve efficiency and resolve bottlenecks.

**Real-Time Monitoring and Operational Optimization**

The integration of smart technologies in RMG factories facilitates seamless real-time monitoring. IoT systems employing sensors are pivotal in capturing data related to energy consumption and equipment performance. Such systems enable predictive maintenance, reducing downtime and improving overall efficiency by notifying operators of potential issues before they occur.

Lighting automation, incorporating occupancy sensors and daylight harvesting systems, ensures lighting efficiency by IESNA, IEC, and BNBC standards, contributing to both safety and energy conservation.

**Enhancing Traceability and Transparency**

Smart systems also bolster transparency and traceability within supply chains, fostering ethical production practices through the use of blockchain technology. This technology ensures that every step of the production process is documented and verified, thereby enhancing accountability and reducing the likelihood of malpractice.

By leveraging these advanced smart systems, RMG factories in Bangladesh can achieve greater operational efficiency while ensuring adherence to ethical standards, thereby maintaining their competitiveness in the global apparel market.

**Smart Systems: Integration of Intelligent Technologies**

Smart systems form the backbone of future-proof RMG factories, enabling real-time monitoring and operational optimization:

- **IoT-Enabled Monitoring**: Employ sensors and IoT systems to track energy, water, and material usage, enhancing resource management.
- **Automated Machinery**: Leverage automated cutting, sewing, and finishing equipment to optimize efficiency and precision.
- **Digital Twin Technology**: Use virtual replicas of facilities to simulate, predict, and improve production processes.
- **Lighting Automation**: Install occupancy sensors and daylight harvesting systems for lighting efficiency, following **IESNA, IEC,** and **BNBC** standards for illumination for industrial occupants and process areas.
- **AI-Based Process and Maintenance:** AI-based production control and automation are revolutionizing manufacturing by enhancing efficiency, reducing waste, and optimizing operations. Through the use of **machine learning** and **advanced algorithms**, AI systems can analyze vast amounts of real-time data from production lines to predict and address issues before they arise. These systems enable **predictive maintenance**, ensuring that machines are serviced only when necessary, reducing downtime, and increasing the lifespan of equipment. The integration of AI into production control also enables **flexible manufacturing**, where production can be quickly adjusted in response to changes in demand or unforeseen disruptions, leading to more agile and sustainable operations.

**Energy-Saving Strategies**

Energy-saving strategies are pivotal in reducing the energy consumption of both buildings and processes in Bangladeshi RMG factories. Implementing advanced energy management systems helps monitor usage patterns and detect inefficiencies, thus cutting unnecessary energy costs. Retrofitting buildings with energy-efficient lighting systems, such as LED lights, significantly lowers electricity demands. Moreover, the adoption of waste heat recovery systems captures and reuses heat energy, enhancing overall energy efficiency.

**Practical Field-Oriented Energy-Saving Strategies for RMG Buildings and Processes**

Energy efficiency has become a cornerstone for modern RMG and textile factories, driven by the need to reduce operational costs and adhere to sustainability goals. The following strategies, grounded in practical applications, showcase how energy-saving measures can be effectively implemented:

**1. High-Efficiency Motors**

A Bangladeshi textile factory replaced conventional motors with IE4/IE5-rated motors in their dyeing and spinning lines. This upgrade reduced energy consumption by 18% while improving operational stability.

- Implementation Tip: Evaluate motor loads during peak production to select appropriately rated motors.
- Benefit: Lower electricity costs and reduced heat generation in motor operations.

**2. Efficient HVAC Systems for Industrial Purposes**

In a large Ready-Made Garment (RMG) manufacturing unit, HVAC systems were installed in compliance with ASHRAE standards, including 52.1 (Air Quality), 55 (Thermal Comfort), 62.1 (Ventilation for Acceptable Indoor Air Quality), and 90.1 (Energy Standard for Buildings). The system incorporated advanced zoning for cooling demands and utilized Variable Refrigerant Flow (VRF) technology, resulting in a 22% reduction in HVAC energy consumption. This was achieved by dynamically adjusting the refrigerant flow based on real-time load demands, ensuring energy savings without compromising comfort.

Key Actions:

- Energy Modeling: Utilized computational fluid dynamics (CFD) and energy modeling software during the design phase to optimize airflow, cooling load distribution, and system efficiency.
- Maintenance: Implemented a rigorous maintenance schedule, including regular cleaning of air filters (rated MERV 13 or higher) and ductwork to prevent performance degradation and minimize energy losses.
- Energy Recovery: Integrated Heat Recovery Ventilators (HRVs) into the HVAC system to capture exhaust air energy and precondition incoming fresh air, further reducing energy demand.

Practical Outcomes:

- Improved Indoor Air Quality (IAQ): Continuous monitoring of $CO_2$ levels and particulate matter ensured ventilation rates exceeded ASHRAE 62.1 recommendations, optimizing the air quality for a healthier workspace.
- Enhanced Productivity: With improved thermal comfort, demonstrated by maintaining optimal indoor temperatures (22-24°C) and humidity levels (40-60%), employee productivity was significantly boosted, aligning with both comfort and efficiency objectives.

**HVAC Insulation and Energy Saving Technique:**

Proper insulation of HVAC systems distribution networks is essential for maximizing energy efficiency and minimizing heat losses. According to industry standards like ASTM C1693 and ASHRAE 90.1, insulation materials must provide adequate thermal resistance (R-value) to prevent energy wastage. In HVAC systems, insulating ducts, pipes, and air handling units can reduce heat loss or gain by up to **30%**, significantly decreasing the load on heating and cooling equipment.

**3. Energy Recovery Systems**

In an ironing section of an RMG factory, a waste heat recovery unit was installed to capture and reuse heat from exhaust streams. This provided supplementary heating for boiler feed water, saving 12% in fuel costs annually.

- Best Practices:
    - Identify heat-intensive processes and install recovery systems where feasible.
    - Use thermographic cameras to assess areas with excessive heat loss.
- Impact: Reduced reliance on primary heating sources and improved energy utilization.

**4. Renewable Energy Sources**

A textile facility in Dhaka and nearby Dhaka (Gazipur) implemented a hybrid energy model combining rooftop solar panels (400 kWp) and wind turbines (3 kW). The system supplied 30% of the factory's energy needs, significantly lowering grid dependency.

- Steps for Success:
    - Conduct a feasibility study for renewable installations.
    - Use energy storage solutions like lithium-ion batteries to address intermittent supply issues.
- Result: Enhanced energy stability and reduced carbon footprint.

**5. Boiler Efficiency**

Replacing a conventional fire-tube boiler with a condensing boiler in a Bangladesh-based factory reduced fuel usage by 15%. The new boiler also utilized an economizer to preheat feed water using flue gas heat.

- Optimization Measures:
    - Periodically calibrate boiler burners.
    - Ensure insulation of boiler pipes to minimize heat loss.
- Outcome: Lower fuel expenses and improved steam generation efficiency.

**Steam Distribution and Insulation System:**

In steam distribution systems, proper insulation can reduce heat loss by **20-30%**, ensuring that steam reaches its destination at the required temperature without unnecessary energy loss. These energy savings translate directly into reduced fuel consumption, lower electricity bills, and a smaller carbon footprint. Implementing these insulation strategies not only enhances overall energy performance but also supports long-term sustainability goals for industrial facilities. Fiberglass and mineral wool are widely used for their cost-effectiveness and excellent insulating properties, while calcium silicate provides enhanced thermal protection for higher-temperature systems. These materials help maintain steam pressure and temperature, reducing energy consumption, preventing system overheating, and minimizing operational costs.

**Choosing Alternative Fuels for Boilers in RMG/Textile Factories During an Energy Crisis**

Boilers are critical for RMG and textile factories, powering processes like dyeing, steaming, and washing. During energy crises, choosing alternative fuels becomes essential to ensure continuity and sustainability.

Here's a practical approach:

**i. Evaluate Available Alternative Fuels**

**Criteria for Selection**:

- **Availability**: Assess the local and consistent supply of alternative fuels.
- **Cost**: Analyze the price trends and long-term economic feasibility.
- **Efficiency**: Compare the calorific value of alternatives against conventional fuels.
- **Environmental Impact**: Consider emissions and compliance with environmental regulations (e.g., BNBC, DoE).

**Common Alternatives**:

- **Biomass**: Includes wood pellets, sawdust, rice husks, and jute sticks. Biomass is often readily available in Bangladesh and can be used in modified boilers.
    - **Example**: Rice husk has a calorific value of ~3,000-3,500 kcal/kg and is abundant near textile clusters.
- **LNG (Liquefied Natural Gas)**: Suitable where pipeline gas is unavailable. Offers cleaner combustion compared to traditional fuels.
- **Biofuels**: Biodiesel from waste vegetable oil or other organic waste can be used in dual-fuel boiler systems.

- **Industrial Waste Gases**: Use waste gases like methane captured from the anaerobic digestion of effluents.
- **Electric Boilers (Hybrid Option)**: Utilize electricity during off-peak hours where grid power is reliable.

**ii. Modify Boiler Infrastructure**
**Field Considerations**:

- **Retrofitting**: Modify existing boilers to handle dual or multi-fuel operations.
    - **Case Example**: An RMG factory in Dhaka converted its coal-fired boiler to a biomass-compatible system, saving 20% in operational costs.
- **Automation**: Integrate automated control systems to optimize fuel feeding and combustion.

**iii. Assess Boiler Efficiency with Alternatives**
**Practical Steps**:

- Conduct a trial run with alternative fuels to evaluate heat output, boiler performance, and emissions.
- Use economizers and air preheaters to maximize efficiency when switching to fuels with lower calorific values.
- Adopt condensing boilers where alternative fuels generate higher moisture content.

**iv. Monitor Regulatory Compliance**
Ensure that alternative fuels and their combustion processes meet environmental and safety standards:

- **Bangladesh Standards**: Department of Environment (DoE) emission limits.
- **Global Standards**: Comply with ASTM D396 (fuel oil specifications) or equivalent for alternative fuels.

**v. Case Study for Crisis Response**
**Scenario**: A dyeing factory faced a natural gas shortage.
**Action Taken**:

- Switched to biomass (rice husks) as an alternative fuel.
- Retrofitted its existing boiler with a gasifier to ensure efficient combustion.
- Installed an economizer to utilize exhaust heat for preheating water.

**Result**: Operational continuity was maintained, with a 15% reduction in overall energy costs.

**vi. Long-Term Planning**

- **Fuel Storage**: Invest in storage infrastructure for alternatives like biomass or LNG to buffer against supply disruptions.
- **Renewable Integration**: Combine boiler operations with renewable energy sources, such as solar preheating systems.

**6. Air Compressor Efficiency**
In a knitwear production unit, upgrading to a variable speed drive (VSD) air compressor resulted in energy savings of 25%. The VSD adjusted compressor speed based on air demand, avoiding unnecessary energy wastage.

- Actionable Steps:
    - Repair leaks in compressed air systems to avoid energy loss.
    - Implement heat recovery from compressors for use in space heating or water heating.

- Results: Reduced energy costs and increased system reliability.

**How to Select an Air Compressor for Efficiency and Cost-Effectiveness in RMG and Textile Factories?**
Air compressors are vital for powering various equipment in RMG and textile factories. When efficiency and cost are priorities, selecting the right air compressor involves a systematic approach focusing on operational needs, energy savings, and long-term value. Here's a practical guide tailored to the context of Bangladesh's RMG and textile sectors:

**i. Evaluate Factory Requirements**
Key Consideration:
Understand the specific air pressure and volume demands of the machinery and processes in the factory.

- Flow Rate (CFM): Identify the cubic feet per minute (CFM) requirements of all equipment to determine the capacity.
- Pressure (PSI): Confirm the required pressure (pounds per square inch) for peak operational efficiency.
- Usage Pattern: Consider whether the demand is continuous or intermittent to choose between reciprocating and rotary screw compressors.

A factory running multiple sewing and cutting machines with high demand for compressed air should opt for a rotary screw compressor for continuous operation with high efficiency.

Compressed air pipe networking is a vital component in industrial systems, delivering compressed air for various manufacturing processes. According to industry estimates, up to **30% of energy costs** in compressed air systems can be wasted due to poor network design and maintenance. By using insulated pipes, reducing system pressure, and regularly checking for leaks, industries can achieve energy savings of **15-25%**, directly reducing operational costs and enhancing overall system performance.

**ii. Prioritize Energy Efficiency**
Energy costs form a significant portion of operating expenses. Look for energy-efficient models certified for superior performance.

- Variable Speed Drive (VSD): Compressors with VSD adjust motor speed to match air demand, reducing energy consumption during low-load periods.
- IE4/IE5 Motors: Opt for compressors equipped with premium efficiency motors to minimize energy losses.
- Energy Recovery System: Select compressors with heat recovery options to utilize waste heat for other factory processes, such as water heating.

A garment factory saved up to 30% on energy costs by switching to a VSD-enabled air compressor with heat recovery capabilities.

**iii. Analyze Total Ownership Cost**
Key Consideration:
Focus on the total cost of ownership (TCO), not just the upfront cost. Include energy consumption, maintenance, and lifecycle costs.

- Energy Costs: Account for kWh usage over the lifetime of the compressor.
- Maintenance Costs: Choose compressors with easily accessible components for reduced servicing time.

- Lifespan: Invest in reliable brands with extended warranties and proven durability to reduce replacement frequency.

Although a higher initial investment, a compressor with a lifecycle of 15–20 years and lower maintenance requirements can provide better long-term savings.

**iv. Ensure Proper Sizing**

Key Consideration:

Oversized or undersized compressors lead to inefficiencies and increased costs.

- Oversizing Risks: An oversized compressor consumes unnecessary energy, leading to wastage.
- Undersizing Risks: An undersized compressor overworks, causing frequent breakdowns and higher maintenance costs.
- Right Fit: Use demand analysis tools to match the compressor size to actual factory requirements.

Practical Tip:

Conduct an air demand analysis to ensure the compressor meets peak and average needs without oversizing. A factory in Gazipur optimized its operations by selecting a correctly sized 50-HP compressor, reducing energy waste.

**v. Assess the Quality of Compressed Air**

Key Consideration:

For textile factories, high-quality compressed air is critical to avoid contaminating sensitive materials.

- Air Dryers: Install integrated air dryers to remove moisture, ensuring dry air for processes like fabric cutting and printing.
- Filtration Systems: Include multi-stage filtration to eliminate oil and particulate contamination.

A textile printing unit in Narayanganj installed a rotary screw compressor with advanced air filtration, improving production quality by 15%.

**vi. Select Automation Features**

Key Consideration:

Modern compressors with smart controls enhance efficiency and monitoring capabilities.

- IoT-Enabled Monitoring: Real-time data tracking for pressure, temperature, and energy consumption helps optimize usage.
- Remote Control: Allows operators to adjust settings and monitor performance remotely.
- Predictive Maintenance: Systems that detect potential issues early prevent costly downtime.

An RMG factory in Chattogram adopted IoT-based compressors, reducing unplanned maintenance downtime by 25%.

**vii. Focus on Noise and Space Considerations**

Key Consideration:

Compressed air systems should integrate smoothly into the factory environment without disrupting operations.

- Low Noise Levels: Choose compressors with noise levels under 70 dB(A) to ensure worker comfort.
- Compact Design: Operation for vertical or modular designs to save floor space in crowded production areas.

A factory in Dhaka with limited space installed a compact, low-noise rotary screw compressor, improving both workspace utilization and worker satisfaction.

**viii. Explore Renewable Energy Options**

Key Consideration:

For sustainability and energy independence, consider integrating compressors powered by renewable energy.

- Solar-Powered Compressors: Ideal for factories with significant solar installations.
- Hybrid Systems: Combine grid electricity and renewable energy for consistent operation.

An RMG unit in Savar implemented a solar-powered compressor system, achieving significant savings during peak sunlight hours.

**7. Production Machinery with Servomotors**

**Selecting and Designing Production Machinery with Servomotors for RMG and Textile Factories**

The integration of production machinery with servomotors in RMG and textile factories can significantly enhance energy efficiency, reduce operational costs, and simplify maintenance. Servomotors, known for their precision, durability, and efficiency, are ideal for modern textile operations. Here's a guide to selecting and designing such machinery to balance cost, energy savings, and maintenance ease.

**i. Assess Factory Requirements**

**Key Considerations**:

Define the production processes and machinery needs, considering specific tasks like sewing, cutting, dyeing, or printing.

- **Load Requirements**: Determine the torque, speed, and power needs for machinery.
- **Motion Precision**: Identify areas where precision control is critical, such as embroidery or automated cutting.

A factory in Gazipur successfully replaced traditional sewing machine motors with servomotors, achieving a 25% increase in stitching accuracy and reducing defective products.

**ii. Prioritize Energy Efficiency**

**Key Features to Look For**:

- **IE4/IE5 Rated Motors**: Opt for high-efficiency motors to minimize energy consumption.
- **Power Consumption**: Choose servomotors with lower idle power consumption, as RMG factories often have variable loads.
- **Regenerative Systems**: Use servomotors capable of converting excess energy into electricity, which can be reused or stored.

An RMG unit in Dhaka equipped its cutting machines with IE5-rated servomotors, reducing energy costs by 20% compared to older motors.

**iii. Optimize Maintenance and Durability**

**Design for Maintenance**:

- **Modular Design**: Select machinery with easily replaceable servomotor modules to reduce downtime.

- **Predictive Maintenance**: Integrate IoT-enabled sensors for real-time monitoring of motor health, reducing unplanned failures.
- **High Durability**: Use servomotors designed to withstand harsh textile environments, such as high humidity and dust levels.

A textile factory in Narayanganj implemented predictive maintenance on servomotor-equipped looms, cutting maintenance costs by 30%.

**iv. Cost-Effective Selection**
**Balancing Initial and Lifecycle Costs**:

- **Initial Investment**: While servomotors have a higher upfront cost, their operational savings justify the investment.
- **Payback Period**: Calculate ROI based on energy savings and maintenance cost reductions.
- **Standardized Equipment**: Choose standardized servomotors to ensure availability of spare parts and compatibility with future upgrades.

A dyeing factory in Chattogram calculated a payback period of 18 months for its servomotor-driven spinning machines due to reduced energy and repair costs.

**v. Tailor Machines for Process-Specific Needs**
**Process Integration**:

- **High-Torque Servomotors**: For processes like dyeing or cutting, which demand high torque.
- **High-Speed Servomotors**: For tasks requiring rapid operations, such as stitching or weaving.
- **Precision Servomotors**: For embroidery or fabric finishing where exact positioning is vital.

By customizing its embroidery machines with high-precision servomotors, an RMG factory in Savar reduced fabric wastage by 15%.

**vi. Incorporate Automation and Smart Controls**
**Automation Features**:

- **Real-Time Monitoring**: Implement smart control systems for process optimization and motor performance tracking.
- **Load Sharing**: Use servomotors with load-sharing capabilities to distribute power efficiently across machinery.
- **Adjustable Speed and Torque**: Enable flexibility to adapt to different fabric types and production demands.

A sewing unit in Ashulia integrated IoT-based servomotor control, achieving a 10% production increase by optimizing machine settings for various fabrics.

**vii. Enhance Operator Safety and Ease of Use**
**Safety Features**:

- **Low Noise Levels**: Choose servomotors that operate quietly, improving worker comfort.
- **Safety Stops**: Equip machines with automatic shutdown features to prevent accidents during faults.
- **User-Friendly Interfaces**: Use interfaces that simplify motor programming and troubleshooting.

A factory in Tongi installed user-friendly servomotor interfaces, reducing operator training time by 40%.

**viii. Comply with Industry Standards**

**Adherence to Codes and Regulations**:

- **Energy Efficiency Standards**: Follow international standards like IEC 60034 for motor efficiency.
- **Safety Standards**: Ensure compliance with NFPA, BNBC, and IBC for safe motor installation and operation.
- **Environmental Standards**: Choose motors meeting RoHS and WEEE directives for environmental responsibility.

An RMG factory aligned its servomotor selection with ASHRAE and IEC guidelines, achieving certification for its green building design.

**Future Compliance for Industries**

Looking ahead, Bangladeshi RMG factories are preparing for future compliance by mitigating utility needs and social responsibilities. They are aligning with global environmental regulations, such as the European Union's Eco-design for Sustainable Products Regulations, to maintain competitiveness in international markets. Socially, these factories prioritize worker welfare by ensuring safe working conditions and fair labor practices, which are crucial for maintaining social licenses to operate. By fostering a culture of sustainability and ethical business practices, these factories not only meet regulatory demands but also contribute positively to community development.

**Future Compliance to Mitigate Utility and Social Purposes**

Bangladesh's RMG industry must prioritize compliance with evolving environmental and social standards:

- **Global Certifications**: Achieve certifications like **LEED**, **ISO 50001** for energy management, and **SA8000** for social accountability.
- **Worker Well-Being**: Design factories with abundant natural light, ergonomic workstations, and ventilation to improve productivity and health.
- **Community Engagement**: Invest in local infrastructure, such as schools and healthcare facilities, to strengthen community relations.
- **Climate Resilience**: Construct factories with materials and layouts designed to withstand extreme weather conditions prevalent in the region.

**1. Challenges in Meeting Future Compliance**

**Key Challenges**:

- **Infrastructure Limitations**:
  - Many factories still rely on outdated machinery and lack the infrastructure (BNBC, RSC, Nirapon) for compliance with advanced standards.
- **High Initial Costs**:
  - Adopting advanced energy-efficient systems, automation, and water treatment facilities requires significant upfront investment.
- **Regulatory Complexity**:
  - Keeping up with diverse and evolving international standards such as GOTS, OEKO-TEX, and ISO can be overwhelming for small- to mid-sized enterprises.
- **Workforce Training**:

- Lack of skilled personnel to operate advanced machinery and manage sophisticated compliance processes is a persistent challenge.

- **Market Pressures**:
  - Buyers increasingly demand faster delivery cycles and lower costs, which can conflict with the goals of sustainable and compliant production.
- **Data and Traceability**:
  - Implementing and managing blockchain or AI-driven traceability systems require advanced IT infrastructure and expertise.
  -

**2. Strategies to Overcome Challenges**

- **Capacity Building**: Provide training and certifications for workers and management on compliance and advanced technology.
- **Government and Industry Support**: Leverage subsidies or incentives for sustainable upgrades.
- **Collaboration with Buyers**: Align sustainability goals with buyers to share costs and create long-term partnerships.
- **Incremental Investments**: Start with low-cost, high-impact measures such as LED lighting, and gradually adopt more advanced systems.

**2. SOPs (Standard Operating Procedures) for Future Factories**

**Key Elements**:

i. **Energy Management**:
   - Conduct regular energy audits as per ISO 50001.
   - Monitor and optimize energy consumption using IoT-enabled systems.

ii. **Waste and Water Management**:
   - Segregate waste streams and recycle or reuse wherever possible.
   - Implement water recycling systems adhering to ISO 14001 environmental management standards.

iii. **Occupational Health and Safety (OHS)**:
   - Ensure worker safety training programs follow ISO 45001 guidelines.
   - Monitor air quality and noise levels within OHS/OSHA/BNBC-prescribed limits.

iv. **Automation and Smart Technologies**:
   - Develop digital twins for predictive maintenance and process optimization.
   - Use AI for quality control to minimize defects and ensure compliance with product standards.

v. **Sustainable Procurement**:
   - Draft supplier codes of conduct based on ISO 20400 sustainable procurement principles.
   - Regularly audit suppliers for environmental and ethical compliance.

**Conclusion**

Bangladesh's future RMG and textile factories will thrive by integrating sustainability, smart systems, and energy-saving measures into their core operations. By prioritizing environmentally responsible designs, leveraging intelligent technologies, and ensuring compliance with both utility and social requirements, the industry can solidify its position as a global leader in sustainable manufacturing. This vision aligns not only with international standards but also with the long-term growth aspirations of Bangladesh's economy and society.

# Energy-Efficient Electrical Accessories for Sustainable Industrial Operations

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In the modern industrial era, selecting sustainable electrical process appliances is pivotal for reducing operational costs, conserving energy, and minimizing environmental impact. Achieving these goals requires a strategic approach that combines technical knowledge, adherence to standards, and integration of energy-saving technologies. Below is a step-by-step guide to selecting these appliances:

**1. Define Operational Needs and Performance Requirements**

Begin by evaluating the specific operational requirements of the process:

- **Capacity and Load:** Determine the required operational capacity and load conditions.
- **Efficiency Needs:** Set benchmarks for performance efficiency under varying conditions.
- **Process Integration:** Ensure compatibility with existing systems and processes.

This ensures that the appliance meets the technical and process-specific demands without over-specification, which often leads to wasted energy.

**2. Prioritize Energy Efficiency Standards**

Operation for appliances that adhere to recognized energy efficiency standards, such as:

- **IEC Standards:** Ensure compliance with IEC standards for industrial electrical equipment.
- **Energy Star Ratings:** Look for Energy Star-certified appliances, which are designed to minimize energy consumption.

- **ISO 50001 Certification:** Prefer suppliers that follow ISO 50001 guidelines for energy management systems.
- **ASHRAE 90.1** provides benchmarks for energy-efficient HVAC systems in buildings.

High-efficiency appliances typically consume less energy, reduce waste, and have lower operational costs over their lifespan.

### 3. Incorporate Smart Technology


Choose appliances equipped with smart technology that enables monitoring and optimization:

- **IoT Integration:** Devices connected to IoT platforms allow real-time energy monitoring and predictive maintenance.
- **Automation Features:** Automate start/stop cycles, load management, and process adjustments to reduce energy use during off-peak times.
- **AI-Driven Optimization:** Appliances with AI features can analyze performance patterns and recommend adjustments for better energy utilization.
- **Building Automation Systems (BAS):** Integrate BAS to control lighting, HVAC, and other systems dynamically, reducing energy usage during low-demand periods.

### 4. Evaluate Lifecycle Costs

Consider the total cost of ownership (TCO) rather than just the upfront cost:

- **Energy Consumption:** Calculate expected energy savings over the appliance's lifetime.
- **Maintenance Costs:** Prefer appliances with low maintenance requirements and long service intervals.
- **Durability and Longevity:** Durable appliances often justify higher initial costs through extended operational life.

**5. Select Renewable Energy-Compatible Devices**
Operation for appliances designed to operate efficiently with renewable energy sources, such as solar or wind power. These devices can be integrated with on-site renewable installations, further reducing the environmental footprint.

**6. Assess the Supplier's Sustainability Practices**
Select manufacturers or suppliers committed to sustainable practices:

- **Green Manufacturing:** Ensure the supplier uses eco-friendly materials and production methods.
- **Recyclability:** Verify that the appliance components are recyclable or have a safe disposal process.
- **Transparency:** Choose suppliers that provide clear data on energy performance and environmental impact.

**7. Consider Advanced Features for Energy Saving**
Look for specific features that promote energy savings:

- **Variable Frequency Drives (VFDs):** Adjust motor speed and reduce energy use during low-demand periods.
- **Energy Recovery Systems:** Devices with energy recovery capabilities can capture and reuse waste energy.
- **High-Efficiency Motors:** Operation for motors rated IE4 or IE5 for maximum efficiency.

**8. Analyze Environmental Impact**
Conduct a life cycle assessment (LCA) of the appliance, from manufacturing to disposal. Choose appliances with the least environmental impact while maintaining operational efficiency.

**9. Engage in Regular Training and Awareness**
Ensure the workforce is trained to operate appliances in energy-efficient ways:

- Encourage turning off equipment during downtime.
- Promote regular maintenance to prevent energy losses due to wear and tear.

**10. Monitor and Review Performance**
Implement energy monitoring systems to track the appliance's energy consumption post-installation. Regularly review performance metrics to ensure alignment with sustainability goals and make improvements as needed.

**Best Practices for Sustainability and Energy Efficiency at Industries**
Sustainable industries require power distribution elements that optimize energy use, reduce environmental impact, and maintain reliability. Below is a detailed evaluation of the listed power distribution elements to determine their suitability for sustainability and energy efficiency.

## 1. LED Lighting Systems

**Sustainability and Energy Efficiency Features:**

- **High Energy Efficiency:** LEDs consume significantly less power than traditional incandescent or fluorescent lights, reducing electricity consumption by up to 75%.
- **Long Lifespan:** LEDs last up to 50,000 hours, decreasing maintenance costs and waste generation.
- **Low Heat Emission:** LEDs produce minimal heat, reducing cooling loads in industrial environments.
- **Smart Controls:** Integrate with motion sensors, daylight harvesting, and dimmers for optimal energy use.

**CRI Requirements for LED Light**

- **Minimum CRI for Green Buildings**:
  - LED lights should have a **CRI of 80 or higher** to ensure good color rendering quality.
  - For spaces where high color accuracy is critical (e.g., healthcare facilities, retail stores, art galleries), a **CRI of 90 or above** is recommended at the LEED rating building.
- **Why CRI Matters**:
  A high CRI indicates better color rendering, enhancing visual comfort and productivity. It is particularly important in areas where natural light is limited or absent.

**Color Temperature Requirements**

- **Measured in Kelvin (K)**:
  - **Warm Light (2700K - 3000K)**: Suitable for residential spaces, hospitality areas, and relaxation zones, as it provides a cozy ambiance.
  - **Neutral Light (3500K - 4100K)**: Ideal for offices, classrooms, and workspaces, offering a balance between warmth and coolness.
  - **Cool Light (5000K - 6500K)**: Used in industrial areas, hospitals, and laboratories where bright, daylight-like illumination is needed.
- **Green Building Preference (LEED)**: A range of **3500K to 5000K** is commonly recommended in green buildings to mimic natural daylight, promoting better health and productivity.

**Best Practices:**

- Use LEDs with high lumens-per-watt (lm/W) ratings.
- Operation for fixtures with adaptive lighting technology that adjusts brightness based on occupancy or natural light.

**Summary for Specification**

| Parameter | Requirement |
|---|---|
| CRI | ≥ 80 (general); ≥ 90 (critical color areas) |
| Color Temperature | 3500K - 5000K (neutral to cool white light) |
| Energy Efficiency | 120-150 lumens per watt |

**4. Busbar Trunking System (BBT)**

**Sustainability and Energy Efficiency Features:**

- **Low Transmission Losses:** Offers superior efficiency compared to traditional cabling systems by minimizing resistive losses.
- **Scalability and Flexibility:** Modular design allows for easy reconfiguration and expansion, reducing material waste during upgrades.
- **Fire Resistance and Durability:** Enhances safety and reduces replacement frequency.

**Best Practices:**

- Use BBT systems with high-grade copper or aluminum conductors for optimal conductivity.
- Operation for systems compliant with IEC 61439 standards for low-voltage switchgear and control gear assemblies.

**Comparison: Busbar Trunking System (BBT) vs NYY Cable**

**Sustainability**

| Aspect | Busbar Trunking System (BBT) | NYY Cable |
|---|---|---|
| Material Usage | Modular design minimizes material wastage. | Requires more extensive wiring and conduits, leading to higher material consumption. |
| Recyclability | Conductors (aluminum/copper) and casing (aluminum/steel) are highly recyclable. | Recyclability is lower; plastic insulation poses challenges for recycling. |

| Aspect | Busbar Trunking System (BBT) | NYY Cable |
|---|---|---|
| Environmental Impact | Lower environmental footprint during installation due to less material and waste. | Higher environmental impact from PVC insulation and cable shielding. |
| Future Scalability | Highly sustainable due to ease of modification and extension without waste. | Limited scalability; additions or modifications often require new cabling runs. |

**Winner: BBT is more sustainable due to modularity and recyclability.**

**Efficiency**

| Aspect | Busbar Trunking System (BBT) | NYY Cable |
|---|---|---|
| Transmission Losses | Low resistive losses due to high conductor cross-sections and short, direct paths. | Higher losses due to longer cable lengths and smaller conductor cross-sections. |
| Voltage Drop | Minimal due to superior conductor design and shorter distribution paths. | Higher voltage drops over long distances, affecting performance. |
| Heat Dissipation | Better heat management with ventilated enclosures. | Poor heat dissipation; insulation may degrade over time. |
| Flexibility in Load | Modular design easily adapts to varying load requirements. | Fixed configuration; less adaptable to load changes. |

**Winner: BBT outperforms in efficiency due to reduced losses and better adaptability.**

**Cost**

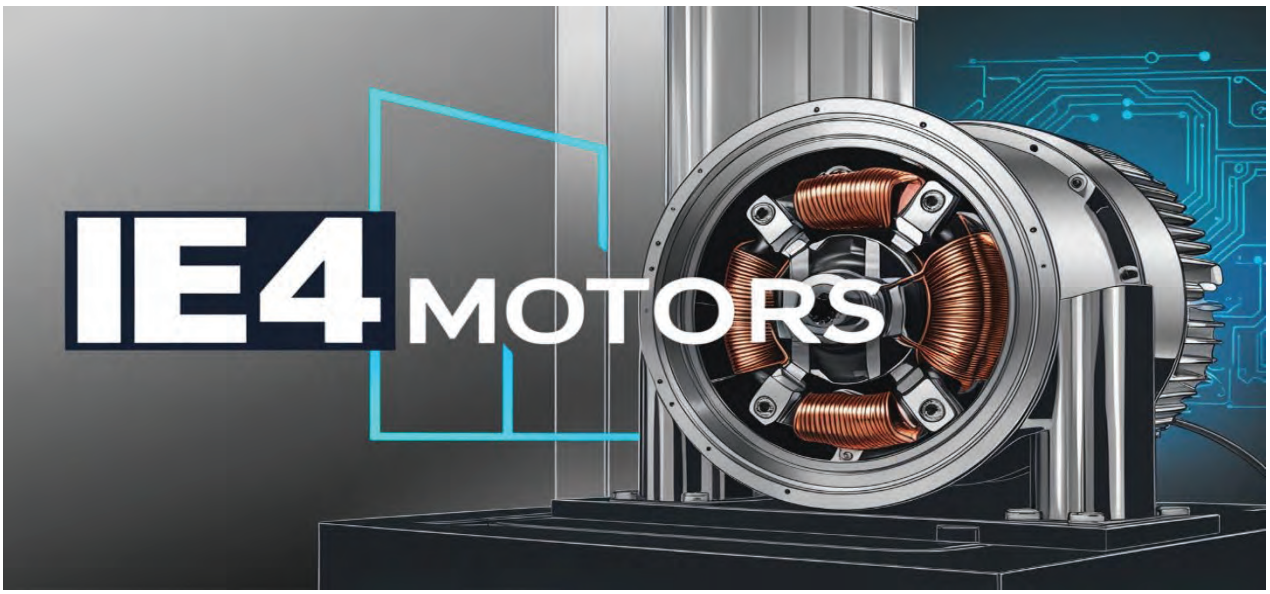
| Aspect | Busbar Trunking System (BBT) | NYY Cable |
|---|---|---|
| Initial Investment | Higher upfront cost due to material and installation complexity. | Lower initial cost; cables and accessories are relatively inexpensive. |
| Installation Costs | Faster and easier installation reduces labor costs. | Requires more labor-intensive installation with conduits and supports. |
| Maintenance Costs | Minimal maintenance due to modular, robust design. | Higher maintenance due to insulation wear, repairs, and replacement needs. |
| Lifecycle Costs | Long-term cost-effectiveness due to energy savings and lower maintenance. | Higher lifecycle costs due to inefficiency and frequent replacements. |

**Winner: NYY cables have a lower initial cost, but BBT is more cost-effective over the system's lifetime.**

**Overall Comparison:**

| Criterion | Winner | Reason |
|---|---|---|
| Sustainability | BBT | Lower material waste, higher recyclability, and easier scalability. |
| Efficiency | BBT | Lower resistive losses, minimal voltage drops, and better heat dissipation. |
| Cost | BBT (lifecycle) | While NYY cables have a lower initial cost, BBT offers significant savings in the long run. |

## 5. Motors




**Sustainability and Energy Efficiency Features:**

- **High-Efficiency Standards:** Operation for IE4 or IE5 motors for best-in-class energy performance.
- **Variable Frequency Drives (VFDs):** Regulate motor speed based on demand, reducing energy waste.
- **Smart Motor Control Systems:** Enable real-time monitoring and adjustments to optimize energy consumption.

**Efficiency Values of IE3 and IE4**

| Motor Power Rating (kW) | IE3 (Premium Efficiency) | IE4 (Super Premium Efficiency) |
|---|---|---|
| **0.75 kW** | 82.5% | 85.4% |
| **1.1 kW** | 84.1% | 87.4% |
| **1.5 kW** | 85.3% | 88.4% |
| **2.2 kW** | 86.7% | 89.6% |
| **3.0 kW** | 87.7% | 90.4% |
| **4.0 kW** | 88.6% | 91.2% |
| **5.5 kW** | 89.6% | 92.0% |
| **7.5 kW** | 90.4% | 92.6% |
| **11 kW** | 91.4% | 93.5% |
| **15 kW** | 92.1% | 94.1% |
| **18.5 kW** | 92.6% | 94.6% |
| **22 kW** | 93.0% | 94.9% |
| **30 kW** | 93.6% | 95.4% |
| **37 kW** | 94.0% | 95.8% |
| **45 kW** | 94.3% | 96.1% |
| **55 kW** | 94.7% | 96.4% |

| Motor Power Rating (kW) | IE3 (Premium Efficiency) | IE4 (Super Premium Efficiency) |
|---|---|---|
| **75 kW** | 95.0% | 96.7% |
| **90 kW** | 95.2% | 96.9% |

**Best Practices:**

- Regularly monitor motor performance to detect inefficiencies or maintenance needs.
- Use motors specifically designed for industrial applications with high starting torque and low energy draw.

**Conclusion**

Selecting sustainable industrial electrical process appliances requires a comprehensive approach that balances technical specifications, energy efficiency, and environmental responsibility. By combining energy-saving technologies, adherence to global standards, and informed supplier selection, industries can optimize energy use while contributing to broader sustainability objectives in the modern era.

# Revolutionizing Urban Mobility: The Rise of Air Taxis in the UAE and GCC

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The future of transportation is taking flight, and the UAE is at the forefront of this technological revolution. With the imminent launch of **air taxis**, the region is set to redefine urban mobility, offering a solution to the ever-growing problem of traffic congestion in its bustling cities. The introduction of air taxis, particularly in Dubai, will mark a monumental shift in how people travel, blending innovation, convenience, and sustainability. This article delves into the exciting world of air taxis, their potential, and the impact they are expected to have in the UAE and the wider GCC.


**What are Air Taxis?**

Air taxis, or **eVTOL** (Electric Vertical Take-Off and Landing) aircraft, are highly advanced, drone-like flying vehicles capable of transporting passengers quickly and safely over short distances. Powered by electricity, these futuristic vehicles are designed to operate in densely populated areas, flying over urban landscapes to alleviate road traffic and reduce travel time. With Dubai leading the charge, air taxis are projected to become operational by **2026**, positioning the city as the world's first to offer a fully electric air taxi service for commercial use.


Worlds First Flying Taxi in Dubai

**Dubai's Vision for Air Taxis**

Dubai, known for its innovative approach to urban development, has partnered with **Joby Aviation**, a U.S.-based company, to spearhead the launch of air taxis. The **Dubai Roads and Transport Authority (RTA)** has granted Joby exclusive operational rights for six years, aiming to integrate air taxis into the city's transport network. Trials have already commenced, with plans to establish **vertiports** (air taxi terminals) at key locations such as **Dubai International Airport**, **Palm Jumeirah**, **Downtown Dubai**, and **Dubai Marina**.

The air taxis will operate at speeds of up to 320 km/h, drastically reducing travel times. For instance, a journey from **Dubai International Airport (DXB)** to **Palm Jumeirah**—which would typically take 45 minutes by car—will take just **10-12 minutes** by air taxi.


**Vertiports** (air taxi terminals) at key locations

**How Do Air Taxis Work?**

These air taxis are powered by electricity, making them a sustainable alternative to traditional modes of transportation. They function similarly to helicopters but are quieter and more energy-efficient. With the ability to take off and land vertically, air taxis can access locations with minimal infrastructure, making them ideal for city use. A **pilot and up to four passengers** can be accommodated in each air taxi, ensuring that trips are not only fast but also comfortable.


A standout feature of Dubai's air taxi service will be the ease of booking. Passengers will be able to schedule rides through a **dedicated mobile app**, similar to how rideshare services like Uber function. As air taxis become more common, fares are expected to be comparable to premium rideshare options such as Uber Black or Uber Comfort.

**The Broader GCC Context**

While Dubai is spearheading air taxi implementation, other GCC nations are not far behind. **Abu Dhabi** has already signed a memorandum of understanding with Joby Aviation to bring air taxis to the UAE's capital, adding to the country's expanding **Advanced Air Mobility (AAM)** network. The UAE is setting the stage for regional leadership in air mobility, with the potential to inspire other GCC countries such as **Saudi Arabia** and **Qatar** to explore similar initiatives.

The global air taxi market is predicted to grow exponentially in the coming years. Valued at **$4.9 billion** in 2023, this market is expected to skyrocket to **$80.3 billion by 2029**, driven by the need for alternative urban transportation and the increasing congestion in cities.

By 2029, the air taxi market is predicted to grow to $80.3bn [Roselle Chen/Reuters]

**Key Challenges and Opportunities**

Although air taxis promise a bright future, several challenges must be addressed before they can become a widespread reality. Regulatory approvals, infrastructure development, and public acceptance are all crucial factors. For example, the establishment of **vertiports**—dedicated landing and take-off zones for air taxis—will require significant planning and investment. Dubai's initial network will consist of four vertiports, but this number is expected to grow as the demand for air taxi services increases. Furthermore, safety concerns and air traffic management will play critical roles in the success of air taxis. The skies above major cities will need to be carefully managed to prevent collisions and ensure that both passenger and cargo air vehicles can operate safely. In addition to advanced **air traffic control systems**, regulations governing low-altitude air travel will need to be updated to accommodate the growing use of eVTOL aircraft.


Despite these challenges, the introduction of air taxis offers numerous opportunities for growth. By reducing travel times, air taxis will improve productivity, enhance tourism, and reduce the environmental impact of transportation by using clean energy. For GCC nations like the UAE, these advancements also position the region as a global hub for innovation, aligning with national visions to diversify economies and reduce dependence on oil.

**A Glimpse into the Future**

The UAE's air taxi project is more than just a transportation initiative—it's a testament to the country's commitment to becoming a global leader in technology, sustainability, and urban planning. With a focus on **smart cities** and **future mobility**, air taxis will not only transform how people move but also reshape the urban landscape. As part of Dubai's broader vision, these advancements reflect the country's ambition to be a model of **technological excellence** and **global cooperation**.

Moreover, the UAE's strategic initiatives, like the **"Bring Your Impossible"** campaign, invite international investors, thinkers, and innovators to contribute to the country's bold vision. Air taxis are just one example of how the UAE is leveraging technology to create a future where no idea is too ambitious.

**Conclusion**

The introduction of air taxis in the UAE and GCC marks a turning point in urban mobility. As cities become more congested and the demand for faster, greener transport options grows, air taxis offer a viable and exciting solution. With Dubai leading the charge and other GCC countries likely to follow, the region is poised to become a global leader in **Advanced Air Mobility**. The skies are no longer the limit; they are the future of transportation.

By embracing this futuristic vision, the UAE is not only addressing immediate challenges like traffic congestion but also positioning itself as a trailblazer in sustainable and innovative urban solutions. The next few years will be pivotal as the air taxi market takes flight, reshaping the way we think about travel and mobility in the 21st century.

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# Is nuclear energy important for a sustainable energy future, or does it carry too many risks?

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Nowadays, the world is more in need of electricity than ever before. If current sectors that rely on fossil fuels, such as cars, continue to transition into the electric field, a significantly larger amount of electricity will be required. Globally, around 61.3% of electricity is generated from fossil fuels, 16.6% from hydropower, 9.4% from renewable sources like solar, wind, geothermal, and tidal, and 10% from nuclear energy [1, Fig. 2]. To sustainably meet the increasing electricity demands around the globe without aggravating the effects of climate change, a transition needs to be made from fossil fuels to clean energy. Nuclear energy, which is the largest low-carbon power after hydropower [1, p.1], is one of the most promising suppliers of electricity despite not being renewable; however, some are against nuclear power due to the risks that come with it, and advocate for renewable energy instead. This essay aims to argue why nuclear energy is essential for achieving a sustainable future for reasons such as low greenhouse emissions, high efficiency and reliability.

One of the main positives of nuclear energy is its minimal greenhouse gas emission. To start with, nuclear power plants produce substantially smaller amounts of carbon dioxide gas compared to coal. In fact, proper natural gas power plants produce 40 times more carbon emissions per kilowatt-hour compared to nuclear plants [2, para. 3]. Additionally, carbon emissions are predicted to be deducted by 8 million tons by the year 2030 if new nuclear plants are implemented, which is the same amount of greenhouse gas emitted by 22 gas-powered plants (500 MW each) [3, p. xvi]. Substituting fossil fuel plants with nuclear ones could be instrumental in enhancing air quality and combating climate change. Another point for nuclear power is that nuclear energy is the lowest carbon-emitting source of electricity. A report by the United Nations Economic Commission for Europe (UNECE) shows that nuclear power leaves the lowest carbon footprint out of any other technology over its full lifecycle [4, para. 1]. To expand, nuclear fission, the process by which nuclear energy is produced, does not directly emit any greenhouse gases; rather, carbon is produced through other means such as the formation of the power plants [5, p. 1]. This proves nuclear energy, in its essence, to be one of the best sustainable and cleanest sources of electricity. In addition, investing in nuclear technologies can help achieve decarbonization goals. Studies indicate that in 30 countries that rely on nuclear energy, carbon emissions from generating electricity fall below the world average by 19% [6, Fig. 1]. Moreover, nuclear power is shown to be accountable for the quickest drop in carbon emissions in nuclear nations such as Canada, France, Saudi Arabia, and South Korea [7, para. 6]. In consideration of these points, nuclear power establishes its vital role in tackling climate change and achieving the global target of zero carbon emissions.
A further benefit of nuclear energy is its efficiency and reliability in giving power. Nuclear is one of the densest forms of energy among any other source of power. The main reason for this is that a nuclear reactor's primary fuel, uranium, has an energy density that is extremely high, allowing it to produce enormous amounts of energy with very little fuel [8, para. 31]. To support this, the amount of energy generated by a single pellet for uranium is equivalent to the amount produced by one ton of coal [9, para.1]. The high energy generation of nuclear plants reduces the need for frequent fuel supplies, which can benefit countries with limited resources. Furthermore, nuclear energy is very consistent when it comes to generating power, making it the most reliable source of energy. Studies report that nuclear energy operates at maximum output for about 92% of the time during a year, making it the source with the highest capacity factor by energy [10, Fig. 1].

This is unlike solar and wind plants, which have intermittent issues due to their heavy dependence on environmental factors, making nuclear power around three times more reliable than them [10, p. 7]. Nuclear plants' consistency in producing energy helps it meet electricity demands without interruption. In addition, nuclear energy's efficiency can be enhanced. Nuclear energy has the potential to produce large amounts of energy cost efficiently when scaled up [11, p. 197]. Essentially, the cost per unit of energy produced decreases as production increases. This cost efficiency is beneficial, especially as global energy demands rise, making nuclear energy a cheaper option for countries in the long run. Also, nuclear energy is making progress in its efficiency. For example, the fuel efficiency in nuclear reactors can be improved using the element, Zirconium [12, pp. 99-104]. The discovery of new ways to improve efficiency in nuclear energy shows how there is still more left to be uncovered with regards to how efficient we can get. Despite not being renewable, nuclear energy is extremely reliable and efficient, making it an ideal choice for sustainable development.

Some people often argue that nuclear energy is dangerous in case of a malfunction at the power plant. The most common example they give is the Chernobyl Accident, where the nuclear power plant experienced a meltdown and caused an explosion [13, p. ix]. However, people fail to realize the cause of the incident. The accident was in fact due to a design flaw found in the design of one of the two main reactors that were used, the RBMK reactor, which lacked in meeting safety standards such as poor emergency cooling and fire protection [14, p. 4]. Therefore, it was not so much that nuclear power plants are prone to malfunctioning but actually that the reactor at Chernobyl was not kept up to standards due to negligence. Furthermore, modern safety standards would prevent any accident like that one from ever occurring again. After the meltdown, stricter regulations and improved safety features went into place. Examples include but are not limited to higher levels of training and monitoring, improved reactor designs, and stronger containment structures to prevent the release of radioactive materials [14, p. 6]. As a result, nuclear power plants are, in the modern era, safer than ever before with the chance for a large-scale accident being close to zero.

Overall, the low greenhouse emissions, high efficiency and reliability make it clear that nuclear energy is essential for achieving a sustainable future. Nuclear energy may have risks according to some people but as mentioned, they are negligible, and in the long run it is better as it prevents the negative consequences of fossil fuels.

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# Synergy Volume III: Tech and Innovation News

**Paris 2024 Pioneers a New Era of Sustainable Olympic Games**

Paris 2024, fully aligned with the Olympic Agenda 2020, promises to deliver a more responsible, sustainable, and inclusive Olympic Games. The organizers have outlined a plan to halve the Games-related carbon footprint, focusing on innovative solutions for energy, food, venues, transport, and digital services.

**Anticipating and Avoiding Impact**

Paris 2024 committed to reducing the carbon footprint by 50% compared to previous Games. A carbon budget covering all planning and operations, including spectator travel, ensures alignment with the Paris Agreement on Climate Change. The organizers also calculated a "material footprint," detailing required resources to minimize and manage their life cycle. Utilizing 100% renewable energy and generators powered by biofuel, H2, or batteries, Paris 2024 aims to eliminate the need for diesel generators. Sustainable venue designs consider biodiversity, reducing the Games' environmental impact.

**Reducing, Renting, and Reusing**

Paris 2024's circular economy strategy is based on organizing the Games with fewer resources, better utilizing these resources, and ensuring their second life. Ninety-five percent of competition venues are pre-existing or temporary, with low-carbon construction for new builds like the Aquatics Centre, featuring solar panels and recycled materials. Efforts to reduce and share resources have cut the need for furniture from 800,000 to 600,000 items. Most sports and electronic equipment will be rented, and there are plans to reuse 90% of the Games' six million assets post-Games.

**Regeneration and Community Benefits**

Aligned with the IOC's Olympic Agenda 2020, Paris 2024 aims to enhance local living conditions, especially in Seine-Saint-Denis. The Aquatics Centre will serve as a community sports hub, and the Olympic Village will transform into a residential and business district post-Games. This development includes public and affordable housing and new workplaces. Infrastructure improvements, such as underground electricity lines and noise barriers, along with efforts to clean the River Seine, are part of broader climate resilience planning, improving the quality of life for residents.

**Sustainable Food Initiatives**

Paris 2024 will deliver 13 million meals with half the carbon emissions of average French meals. The food strategy includes doubling plant-based ingredients, sourcing 80% of ingredients locally, and significantly reducing food waste. Efforts to cut single-use plastic and encourage reusable bottles will also minimize environmental impact. Coca-Cola will install 700 water and soda fountains across all Paris 2024 sites, and spectators can bring reusable bottles, a significant shift from current regulations.

**Efficient and Low-Carbon Transport**

Paris 2024 will leverage the city's extensive public transport network, enhanced by new bike lanes. More than 80% of Olympic venues are within 10km of the Olympic Village, minimizing travel time. Public transport will be expanded, and the vehicle fleet will include electric, hybrid, and hydrogen-powered vehicles, with a 40% reduction in fleet size compared to previous Games. This strategy ensures efficient and low-carbon transport solutions.

**Climate Action and Job Creation: A Pathway to Sustainable Economic Growth**

In the evolving landscape of climate change, the intersection of environmental sustainability and economic development presents a unique opportunity for creating jobs while addressing ecological challenges.

At Sustainable Future Coalition, we are committed to supporting innovative projects that not only benefit the environment but also contribute to sustainable economic growth. This dual focus is essential for fostering a resilient and prosperous future.

**The Green Economy: A Job Creation Engine**

The transition to a green economy is driving a significant shift in job markets worldwide. Investments in renewable energy, energy efficiency, sustainable agriculture, and circular economy initiatives are generating new employment opportunities across various sectors. Here’s how:

**1. Renewable Energy Jobs**
The renewable energy sector, including solar, wind, and bioenergy, is one of the fastest-growing job markets. As countries strive to meet climate targets, the demand for skilled workers in renewable energy installation, maintenance, and manufacturing is skyrocketing. Solar panel installers, wind turbine technicians, and bioenergy plant operators are just a few examples of green jobs that are vital for a sustainable future.

**2. Energy Efficiency Careers**
Improving energy efficiency in buildings, transportation, and industrial processes not only reduces greenhouse gas emissions but also creates jobs. Energy auditors, retrofitting specialists, and smart grid engineers play crucial roles in enhancing energy efficiency. These jobs not only contribute to environmental goals but also offer significant cost savings for businesses and consumers.

**3. Sustainable Agriculture Employment**
Climate-smart agricultural practices are essential for ensuring food security and mitigating climate change. Jobs in sustainable agriculture include roles in organic farming, precision agriculture, and the development of drought-resistant crops. These positions support rural economies and promote resilient food systems.

**4. Circular Economy Opportunities**
The circular economy, which emphasizes recycling, reuse, and the development of sustainable materials, is a burgeoning field with vast employment potential. Jobs in this sector range from waste management and recycling operations to the design and manufacturing of eco-friendly products. By closing the loop on resource use, we are creating new economic opportunities and reducing environmental impact.

**Empowering Communities through Green Jobs**
At Sustainable Future Coalition, we recognize that local communities are at the heart of the green economy. We work tirelessly to empower communities with the knowledge, resources, and tools they need to thrive amidst ecological and societal challenges. Our initiatives include:

- **Training and Education Programs**: We offer training programs to equip individuals with the skills needed for green jobs. From technical training for renewable energy installations to courses on sustainable farming practices, our programs help build a skilled workforce ready to tackle climate challenges.

- **Support for Entrepreneurs**: We provide support for green entrepreneurs and startups that are developing innovative solutions for sustainability. Through funding, mentorship, and networking opportunities, we help bring groundbreaking ideas to market.

- **Community Engagement**: We engage with local communities to understand their unique needs and co-create solutions that drive both environmental and economic benefits. By fostering a collaborative approach, we ensure that our projects have a lasting positive impact.

**The Future of Work in a Sustainable Economy**
The transition to a sustainable economy is not just about creating jobs; it's about creating meaningful, rewarding careers that contribute to a healthier planet and a thriving society. As we continue to innovate and invest in green technologies and practices, the potential for job creation is immense.

**Emerging Renewable Energy Technologies to Watch in 2024**

From wave-riding power harvesters to artificial suns, numerous companies are pioneering new ways to produce sustainable energy. Here are some of the most exciting renewable energy technologies to keep an eye on in 2024.

**Harnessing Wave Energy: The Waveline Magnet**

The Waveline Magnet is an innovative, long yellow raft designed to harness wave energy for desalination, hydrogen fuel production, and electricity generation. This prototype, developed over more than a decade, features a unique design that adapts to varying wave conditions.

The Waveline Magnet can be customized in size, ranging from small units to larger configurations, depending on project goals and wave conditions. Alex Zakheos, co-CEO of the company, revealed that the first commercial Waveline Magnet will likely be a smaller unit focused on desalination. Wave energy has historically posed significant engineering challenges due to the ocean's powerful waves and corrosive saltwater. However, the diverse approaches and innovative solutions being developed by various companies show promising advancements, making wave energy a technology to watch.

**The Fusion Power Frontier**

Fusion power has long been considered a challenging but potentially revolutionary energy source. While critics argue that viable fusion power is always at least a decade away, recent milestones bring us closer to a fusion-powered future.

In December 2023, the National Ignition Facility at the Lawrence Livermore National Laboratory achieved a historic first: a fusion reaction that generated more energy than was required to initiate it. This success was repeated in July 2023 with an even higher energy yield. Although achieving a net energy gain is a significant breakthrough, for fusion to become a viable energy source, reactors must consistently produce roughly ten times the energy input. With several fusion projects in various stages of development worldwide, including ITER in France, the Joint European Torus in the UK, and numerous facilities in China, the future of fusion energy is bright.

**Innovative Solar Applications**

Solar power continues to evolve, finding novel applications and pushing the boundaries of where and how it can be utilized. As more companies strive to position themselves as environmentally friendly, solar technology adapts to meet diverse needs.

One exciting development is the integration of solar power into vehicles. Last year, I had the opportunity to ride in an Aptera, a car designed with solar efficiency in mind. Its aerodynamic shape maximizes the efficiency of onboard solar panels. While some solar cars, like the Sono Sion, have faced funding challenges, interest in solar-powered vehicles remains strong.

Solar technology is also making strides in building design with the advent of transparent solar panels. Companies like Solar Window and Ubiquitous Energy are leading the charge, enabling windows to generate electricity without compromising aesthetics.

China launches world's largest open-sea solar farm, marking a new era for offshore solar.

*Aerial view of Guohua Energy Investment's 1-gigawatt offshore PV project in Kenli, Shandong*

**China's new 1-gigawatt offshore solar farm combines innovative marine technology with clean energy production, powering 2.6 million homes while showcasing the future of ocean-based solar power.**
China's state-owned CHN Energy has connected its first batch of photovoltaic units to the grid from its new offshore solar farm in the Yellow Sea. The one-gigawatt facility, situated eight kilometers off the eastern coast of Dongying City, represents the largest open-sea solar installation globally and establishes a new template for marine-based renewable energy projects.

The solar farm, developed by CHN Energy's subsidiary Guohua Energy Investment Co., occupies 1,223 hectares of ocean surface. On reaching total operational capacity, the facility will generate 1.78 billion kilowatt-hours of electricity annually to power 2.67 million urban households while preventing 1.34 million tons of carbon dioxide emissions.

**Coal will be a central pillar of COP31, wherever it's held**
In the shadows of COP29, two of the world's most coal-dependent countries are still bidding to host the UN climate summit in 2026, offering what could be a unique moment to renew focus on coal.

Australia and Türkiye went into COP29 in Baku, Azerbaijan, with a range of diplomatic goals, but none greater than each country's hopes to be announced as the host of the UN climate summit in 2026. For Ufuk and myself, the competition between our respective countries trickled down into a daily banter, and at times, fierce rivalry.

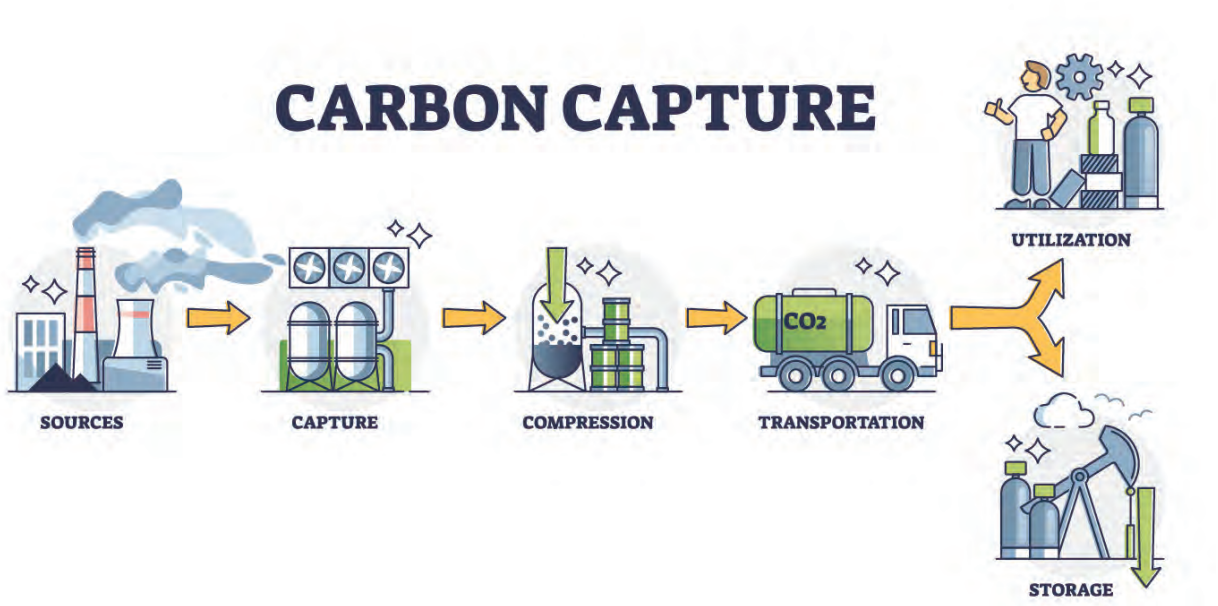
For Türkiye, this is the second time in six years that it has put its name forward as a potential COP host. In 2019, the country challenged the UK for hosting rights of COP26. Since then, President Erdoğan renewed his country's hosting push, bolstered by his attendance at recent UN climate summits, including last year's event in Dubai as one of the few G20 leaders present.

**The Australia-Pacific bid to host UN climate talks in 2026 is in limbo. What now?**
If successful, COP31 would likely be hosted in the coastal city of Antalya.

For Australia, the current prime minister planted the idea of hosting the UN summit soon after coming to office in May 2022. In November of that year, Australia formally announced its bid to host the UN summit, in partnership with 'the Pacific'. Since then, many in Australian government circles assumed it was a sure thing but have since been surprised at the resilience of the Turkish bid.

If Australia is successful, it could be hosted in a number of the country's major cities, but Adelaide is looking like the most likely candidate. The state's premier hosted a welcome reception at COP29 this year, spruiking the opportunity that it could be the first COP hosted in a city run on 100 percent renewables.

The most significant new technology in carbon capture is Direct Air Capture (DAC), which actively removes carbon dioxide directly from the atmosphere, unlike traditional methods that capture CO2 at the point of emission from industrial sources; this allows for the removal of existing atmospheric CO2, considered a key advancement in combating climate change.




Key points about DAC:

- **Function:** Uses specialized filters or sorbents to extract CO2 from ambient air, concentrating it for storage or further utilization.
- **Potential benefits:** Can be deployed anywhere, regardless of CO2 source concentration, offering flexibility for carbon removal on a larger scale.
- **Challenges:** Still in the early stages of development, with high energy requirements and cost being major concerns.

Other emerging carbon capture technologies:

- **Enhanced mineral carbonation:** Utilizing natural minerals to react with CO2, potentially for long-term storage.
- **Bioenergy with Carbon Capture and Storage (BECCS):** Combining biomass energy production with CO2 capture to achieve net-negative emissions.
- **Membrane technology:** Using specialized membranes to selectively separate CO2 from other gases.

**The Top 10 Carbon Capture Technologies Explained**

**Carbon Capture Technologies**

The world is facing an unprecedented climate crisis, and carbon emissions are a major contributor to it. To mitigate the impact of climate change, it is essential to reduce the amount of carbon emissions from various sources. Carbon capture technologies offer remarkable solutions to this problem. By capturing $CO_2$ from industrial processes or the atmosphere and storing it, these technologies can prevent tons of greenhouse gas emissions from entering the atmosphere and contributing to global warming. Know what the top 10 carbon capture technologies and their potential applications are!

**What are the top 10 carbon capture technologies?**

Carbon capture technology has been introduced as a solution to reduce carbon emissions in the atmosphere. This is a great solution to a major problem that the world faces, which is the rise of global temperatures.
Carbon capture, utilization, and storage (CCUS) can capture carbon dioxide ($CO_2$) from various sources, such as power plants, factories, or natural gas processing plants. The captured $CO_2$ can then be transported and stored underground in geological formations.

There are a variety of ways to capture carbon and reduce the problem of global climate change, and the top 10 are the following.

**1. Direct Air Capture (DAC)**

DAC technology uses air filters to capture carbon dioxide from the atmosphere directly. After collecting the $CO_2$, it is then concentrated and transported for storage or conversion into useful products. This technology is still in its early stages, and it is expensive, but with further research and scaling, DAC holds tremendous potential in mitigating carbon emissions from the atmosphere.

**2. Carbon Capture at Power Plants**

This technology is used to capture carbon emissions from power plants before they are released into the atmosphere. The $CO_2$ is then compressed and transported for storage or used for enhanced oil recovery. Although this technology has limitations, it is currently the most widely used carbon capture technology, and the scale of its application can be significant in reducing carbon emissions.

**3. Enhanced Rock Weathering (ERW)**

Enhanced Rock Weathering (ERW) is the usage of crushed silicate minerals and rocks, such as basalt and glauconite, and the application of the resulting material on the soil. This accelerates the natural process of weathering that normally occurs over millions of years, while also increasing the amount of $CO_2$ captured by the soil. One of the most important advantages of this technology is its efficiency, as well as its cost-benefit because it also helps improve soil fertility.

**4. Aqueous Amine-Based $CO_2$ Capture**

This technology involves using amines to absorb $CO_2$ from industrial processes before it's released into the atmosphere. The $CO_2$ is then separated from the amine and transported for storage or reuse. Although this technology is mature, it has some limitations, including high energy consumption and high cost.

**5. Membrane Gas Separation**

Membrane gas separation technology uses permeable materials to separate carbon dioxide and other gases. Because it operates at low temperatures and pressures, it is energy-efficient and cost-effective. While membrane gas separation technology is still in the experimental stage, it holds a lot of promise in the capture, separation, and storage of $CO_2$.

**6. Carbon Capture and Conversion**

This technology involves capturing and converting $CO_2$ into usable products such as fuels, industrial chemicals, and polymers. While still in its infancy, carbon capture and conversion technology is a sustainable approach to reducing the carbon footprint while producing valuable products.

**7. Bioenergy with Carbon Capture and Storage (BECCS)**

BECCS involves capturing carbon dioxide from biomass energy production and storing it. The process not only captures emissions but also generates electricity, and it is carbon-negative. Bioenergy with carbon capture and storage is a low-carbon energy source that can make a significant contribution to decarbonizing the economy.

**8. Chemical looping**

This technology involves using metal-based particles in a process that reacts with carbon dioxide. The metals act as a catalyst, separating the carbon dioxide from the fuel. Afterward, the $CO_2$ is captured and stored while the fuel is left for further combustion. Chemical looping technology is still in the experimental stage, but it shows promise in reducing carbon emissions from industries that rely heavily on fossil fuels.

**9. Cryogenic Carbon Capture (CCC)**

CCC is a relatively new carbon capture technology that relies on cryogenic cooling to capture and remove CO2 from gas streams. It can extract $CO_2$ at a higher rate than conventional systems and can store it at a reduced volume. The application of CCC is still limited, but as the technology matures, it shows great potential in mitigating carbon emissions from various sources.

**10. Carbon Capture Using Nanotechnology**

This technology involves using nanomaterials, such as carbon nanotubes, to capture and store $CO_2$ at much lower pressures than other technologies. This method uses fewer resources, and energy, and produces less waste than other carbon capture technologies. Although carbon capture using nanotechnology is still at its experimental stage, it holds a lot of promise for its scalability and efficiency.

Each of these technologies has its own advantages and limitations, that make one or another more suitable for different scenarios. However, what they have in common is the capability of being an essential instrument in reducing the emission and concentration of greenhouse gases that are a threat to the long-term survival of humanity.

**Each carbon capture technology has different advantages, and they complement each other.**

To summarize, carbon capture technologies are crucial to reducing the carbon footprint in various sectors. While direct air capture and carbon capture at power plants are the most widely used technologies, there are promising experimental technologies like chemical looping and nanotechnology.

# Innovative Presentation Challenge, Panel Discussions and Mentoring Sessions Recap

The Leadership Building and related initiatives, organized by BEAWorld, aim to create an engaging platform for knowledge-sharing, leadership development, and professional mentorship. The events have brought together talented students, industry leaders, and seasoned professionals to discuss critical topics, foster leadership, and inspire innovation.

**Session Recap:**

**Innovative Presentation Challenge**

Session 1: Innovative Student Presentations
Date: November 29, 2024
Moderator: Engr. Rafiqul Islam Talukder, P.Eng.
Presentations:

I. Presenter: Radiah Mubashira Khan Afsa (Grade 08)
Topic: *Produce Pure Water by Reverse Osmosis Process.*
Brief: The presentation explored the reverse osmosis process as a cost-effective and efficient method to produce pure water, emphasizing its relevance in solving global water scarcity issues.

II. Presenter: Sariyah Bint Shamiul (Grade 07)
Topic: *How Can Peer Pressure Affect a Child's Mental Health and Decision-Making Abilities?*
Brief: This session addressed the psychological impacts of peer pressure on young minds, offering strategies to build resilience and enhance decision-making skills.

**Panel Discussions**

1. Process Safety Incident and Mitigation
Date: March 5, 2024
Moderator: Engr. Rafiqul Islam Talukder, P.Eng.
Panel Members:

- Engr. Abdur Rahim – Ex-GM (Technical), KAFCO
- Engr. Hafizur Rahman P.Eng – Chairman, OSB, IEB
- Brig. General Engr. Ali Ahmed – Vice Chairman, OSB, IEB
- Md. Rajiour Rahman Mollick – PD, Ghorashal Palash Fertilizer, BCIC
- Engr. Dr. Md. Easir Arafat Khan – Associate Professor, Chemical Engineering Dept., BUET
- Engr. Kamal Uddin – GM-TECH, KAFCO
- Engr. Shariful Islam – DGM-Operation, KAFCO
- Engr. Md. Zahidul Huq – Head of HSE, KAFCO
- Engr. Md. Al-Emran Hossain PE – President, Bangladesh Green Building Academy
- Engr. Gaisal Ahmed – Fire & Emergency Response Specialist, KSA

Brief: The panel discussed critical approaches to identifying, analyzing, and mitigating process safety incidents in industrial operations, emphasizing proactive safety management strategies.

2. Community Risk Reduction-01 (Fire & Explosion Safety)
Date: June 9, 2024
Moderator: Engr. Rafiqul Islam Talukder, P.Eng.
Panel Members:

- Engr. Dr. Md. Easir Arafat Khan – Associate Professor, Chemical Engineering Dept., BUET
- Engr. Hafizur Rahman P.Eng – Chairman, OSB, IEB
- Brig. General Engr. Ali Ahmed – Vice Chairman, OSB, IEB
- Engr. Md. Al-Emran Hossain PE – President, Bangladesh Green Building Academy
- Engr. Kabir Ahmed Bhuiyan (Chief Guest) – Past President, IEB & Chief Engineer, PWD

Brief: The session focused on fire and explosion safety, addressing risk reduction strategies, safety protocols, and effective emergency management systems to protect communities.

**Mentoring Session**

1. Mentoring to Entry-Level Engineers for Professional Development
Date: October 18, 2024
Speaker: Engr. Shawkat Ali Khan

- Designation: Member of Editorial Board, Synergy; Structural Engineer (Unlimited Floors), Dubai Municipality; Enlisted Structural Engineer, CDA.
- Qualifications: MIEAust (Australia), MIEB, MSOE (UAE)

Brief: This mentoring session provided valuable insights into building competencies for entry-level engineers. Engr. Shawkat Ali Khan shared strategies for professional development, including technical skill-building, leadership, and career progression.

**Final Words:**

The Innovative Presentation Challenge, Panel Discussions, and Mentoring Sessions have successfully created a platform for knowledge-sharing, idea exchange, and professional mentorship. By involving students, industry leaders, and experts, these events have inspired young minds, addressed real-world challenges, and promoted leadership and innovation.

For more details about upcoming events or to revisit past sessions, please visit our official website or group links.

# Knowledge Sharing Sessions Recap

BEAWorld has successfully organized a series of impactful knowledge-sharing sessions within a short span of time. We are pleased to present highlights from these sessions, which brought together experts from diverse fields to explore critical topics and advancements in construction, technology, and safety. Below is a recap of some noteworthy presentations:

**Past Sessions Recap:**

1. Overview of Quality Management System in Construction Projects Date: July 7, 2023

Speaker: Engr. Shamiul Islam, QA/QC Manager, ECC

A comprehensive review of quality management practices essential for construction project success.

2. Medium and High Voltage Switchgear Operational Interlock Date: July 15, 2023

Speaker: Engr. Md. Abdul Latif (AADC)

An exploration of mechanical and electrical interlocks for switchgear safety and functionality.

3. BIM and MEP-Fundamental Overview Date: July 21, 2023

Speaker: Engr. Md Ashraful Alam, Lead MEP Engineer

Insights into Building Information Modeling and its critical role in MEP planning and execution.

4. FOC and Advancement of Photonic Crystal Fibers in Fiber Industry Date: July 28, 2023

Speaker: Dr. Md. Anwar Hossain, Professor of EEE, BUBT

Discussion on the latest advancements in fiber optics and their applications in the fiber industry.

5. Safety Risk and Mitigation Date: August 4, 2023

Speaker: Engr. Rafiqul Islam Talukder, Vice Chairman, Occupational Safety Board Key strategies and measures to mitigate safety risks in engineering projects.

6. Climate Resilient Transport Infrastructures Date: August 9, 2023

Speaker: Dr. Mohammad Shariful Islam, Professor, Department of Civil Engineering, BUET

This session explored strategies to enhance the resilience of transport infrastructure against climatic challenges, emphasizing adaptive and sustainable engineering practices.

7. Infrastructure Master Plan - Initiation & Execution in the Whole Life Cycle of a Development

Date: August 18, 2023

Speaker: Engr. A K M Nizam, Head of Utilities (Infrastructure), ACE International Consultant, UAE

An in-depth look at the stages of infrastructure planning and execution, focusing on long-term development impacts and sustainability.

8. A Brief History of AI and Its Bold Future Date: August 24, 2023

Speaker: Dr. M. Mehedy Masud, Professor, College of IT, UAE University

This presentation covered the evolution of artificial intelligence and projected its future impacts on technology, work, and society.

9. QA/QC Testing Requirements in Construction Projects Date: September 8, 2023

Speaker: Engr. Shamiul Islam, QA/QC Manager, ECC

Insights into the critical quality assurance and control tests necessary for ensuring the integrity and safety of construction projects.

10. Construction of Bangabandhu Sheikh Mujibur Rahman Tunnel Date: September 24, 2023

Speaker: Dr. Hossain Md. Shahin, Dept. of Civil and Environmental Engineering, IUT

A detailed review of the engineering challenges and solutions in constructing this major infrastructure landmark.

11. Line Differential Protection with Backup Distance Date: October 6, 2023

Speaker: Engr. Md. Abdul Latif, AADC, UAE

Discussion on the implementation of line differential protection systems and their importance in maintaining the reliability of electrical networks.

12. Electro-Mechanical System in the Healthcare Construction Date: October 20, 2023

Speaker: Mohd. Gofran, Lead Engineer, AJ Consultants, Saudi Arabia

An overview of the integration of electro-mechanical systems in healthcare facilities, focusing on the unique requirements and standards for medical environments.

13. Green Building Concept & Integrative Strategies Date: November 3, 2023

Speaker: Engr. Md. Al-Emran Hossain PE, President, Bangladesh Green Building Academy

An in-depth discussion on sustainable building practices and the integration of green technologies in modern construction.

14. Project Supervision and Monitoring Techniques Date: November 17, 2023

Speaker: Dr. Abu Naser Chowdhury, Superintending Engineer, PWD, Bogura

Expert advice on effective project management strategies and tools for supervising large-scale projects.

15. Medium Voltage Cable Construction & Fault Finding in Electrical Network Date: December 1, 2023

Speaker: Engr. Md Hassan Ali, Assistant Manager, DEWA

Techniques and challenges in constructing medium voltage cables, along with practical solutions for troubleshooting.

16. French & Its Importance in School & Professional Life Date: December 17, 2023

Speakers: Professeur de français & Engr. Khaja Ahamed, D27 French Language Centre

The significance of learning French and its benefits in academic and professional settings.

17. Life and Safety in High Rise Buildings Date: December 29, 2023

Speaker: Engr. Md. Al-Emran Hossain PE, President, Bangladesh Green Building Academy

Essential safety measures and life-saving protocols essential for high rise building management.

18. Cybersecurity 101: Prevalent Attacks and Defenses Date: January 12, 2024

Speaker: Dr. M. Mehedy Masud, Professor, College of IT, UAE University

A critical overview of common cybersecurity threats and the best practices for protecting digital infrastructures.

19. COP 28 and Bangladesh Perspective Date: January 26, 2024

Speaker: Engr. Rafiqul Islam Talukder, Vice Chairman, Occupational Safety Board, IEB

A comprehensive look at the outcomes of COP 28 and their implications for Bangladesh, focusing on sustainable practices and policy changes.

20. Global Warming and Climate Change: Impacts over Bangladesh Date: January 27, 2024

Speaker: Prof. Dr. Ainun Nishat, Former VC, BRAC University

Analysis of global warming effects specifically on Bangladesh, highlighting decisions made at COP 28 in Dubai and strategic responses.

21. How to Select a Portable Fire Extinguisher for Your Building? Date: February 9, 2024

Speaker: Engr. Md. Al-Emran Hossain PE, President, Bangladesh Green Building Academy

Practical guidance on choosing the right fire extinguisher for different types of buildings, ensuring safety and compliance.

22. Significance of Earthquake Parameters in BNBC on the Design of Building Structures

Date: February 23, 2024

Speaker: Dr. Md. Khasro Miah, Professor, Department of Civil Engineering, DUET A detailed discussion on the importance of considering earthquake parameters in the Bangladesh National Building Code for safer architectural designs.

23. Data Privacy in the Digital Age Date: March 8, 2024

Speaker: Md Raihan Maruf, Data Privacy Manager, Robi Axiata Limited

Insights into the challenges of data privacy today, with strategies for protecting personal and corporate data in an increasingly digital world.

24. Basic Concept of UV Base Disinfection System for HVAC System
    Date: May 11, 2024
    Speaker: Engr. Md. Al-Emran Hossain PE, LEED AP (BD+C), President, Bangladesh Green Building Academy & ASHRAE Bangladesh Chapter
    This session covered the importance and implementation of UV-based disinfection systems in HVAC to ensure healthier indoor air quality.
25. 30. Sustainability Requirements in UAE and Perspective in Bangladesh - Awareness Program in the Year of Sustainability
    Date: May 24, 2024
    Speakers:
    - Engr. Rezaur Rahman, Founder & Organiser, BEAWORLD, Quality & Pearl Qualified Professional, AECOM Middle East
    - Engr. Md. Al-Emran Hossain, President, Bangladesh Green Building Academy & ASHRAE Bangladesh Chapter

An insightful discussion on sustainability requirements in UAE and strategies for integrating them into Bangladesh's construction industry.

26. Re-engineering of Component to Reduce Carbon Emission by Refurbishing Component
    Date: July 13, 2024
    Speaker: Engr. Chilamparasan Chinnapandi, Territory Manager, Castolin Eutectic Middle East FZE
    This session explored techniques to refurbish components for reducing carbon emissions and achieving sustainability goals.
27. Short-Circuit Analysis and Fault Level Calculation
    Date: August 23, 2024
    Speaker: Engr. Md. Majharul Islam, B.Sc. in EEE (BUET) and MBA (DU), Certified Energy Auditor (CEA), Managing Director, Dexterous Engineering
    The session provided an in-depth overview of short-circuit analysis methods and techniques for fault-level calculations in electrical systems.
28. The Current Flood: Cause Analysis, Impact, and Resolution
    Date: September 1, 2024
    Speaker: Professor Dr. Ainun Nishat, Former VC and Emeritus Professor of BRAC University, Former Professor, Department of WRE, BUET
    This presentation analyzed the root causes of recent floods, their impacts, and proposed engineering and policy-based solutions.
29. Means of Egress of Fire Safety as per NFPA 101
    Date: September 13, 2024
    Speaker: Engr. Md. Fazlul Bari, CEO, Optimum Engineer Ltd.
    Brief: An overview of fire safety protocols with a focus on NFPA 101 standards for ensuring safe egress during emergencies.
30. Topic 1: Disaster Management in Flood Affected Area in Bangladesh; Topic 2: ARD's Global Initiatives and Local Sustainable Green Building Model
    Date: September 27, 2024
    Speakers:

Topic 1: Engr. Majharul Islam, B.Sc in EEE, BUET, MBA, DU, Certified Energy Auditor, Dexterous Engineering
Topic 2: Arch. Samsun Nahar, CEO, Architecture Research and Development (ARD)
A dual session addressing disaster management practices in flood-prone regions and sustainable green building initiatives for long-term resilience.

31. Cause of Delays in Engineering, Procurement, Construction, Project Management & Finance
    Date: October 4, 2024
    Speaker: Engr. Harun Rashid, MRICS, MCIOB, MSc (UK), B.Sc. (Engr.), MWCC, MBIAC, Contract Specialist, Construction Supervision Consultant, Bangladesh Army, Padma Bridge Rail Link Project
    A detailed exploration of delays in large projects, their causes, and mitigation strategies across engineering and financial domains.
32. Repair and Rehabilitation of the Prestressed Girder Bridge
    Date: November 2, 2024
    Speaker: Engr. Akhtar Zaman P.Eng., Senior Structural Engineer, Hilcon Limited, Canada, Former Assistant Professor (KUET)
    Brief: This session highlighted techniques and case studies for repairing and rehabilitating prestressed girder bridges to ensure structural integrity.
33. Introduction and Roadmap to Structural Engineering Career
    Date: November 22, 2024
    Speaker: Engr. Shawkat Ali Khan, MIEAust, MIEB, MSOE, Structural Engineer, Dubai Municipality
    A career-focused session providing guidance on pursuing a successful path in structural engineering and associated professional opportunities.
34. Decarbonizing the Built Environment: The Role of Embodied Carbon, LCAs, and EPDs Begins
    Date: December 6, 2024
    Speaker: Engr. Md. Al-Emran Hossain PE, LEED AP (BD+C), President, Bangladesh Green Building Academy & ASHRAE Bangladesh Chapter
    This session emphasized the role of Life Cycle Assessments (LCAs) and Environmental Product Declarations (EPDs) in reducing embodied carbon in construction.

Don't miss our upcoming webinars for more opportunities to gain valuable insights from industry leaders.

**Upcoming Sessions**

35. Engineering Contribution of Dr. F.R. Khan on Tubular System to Design of Super Tall Buildings
    Date: December 15, 2024
    Speaker: Engr. Akhtar Zaman P.Eng., Senior Structural Engineer, Hilcon Limited, Canada, B.Sc. (BUET), M.Sc. (AIT), Former Assistant Professor (KUET)
    This session highlighted Dr. Fazlur Rahman Khan's groundbreaking contributions to structural engineering, focusing on the tubular system for designing super tall buildings.provide insights into global carbon trading frameworks and practical steps for participating in these markets.
36. Basic Concept of UV Base Disinfection System for HVAC Systems by Engr. Md. Al- Emran Hossain PE, President, Bangladesh Green Building Academy. Understanding the role and benefits of UV-based disinfection technologies in HVAC systems is crucial for maintaining healthy indoor environments. Engr. Hossain will outline the fundamental concepts, benefits, and implementation strategies of UV disinfection systems in modern building management.

For more information on future events or to access recordings of past sessions, please visit our website or group links.

# Students' Leadership Session Recap

The Students' Leadership Building Program organized by BEAWorld continues to encourage students to engage in meaningful discussions and develop leadership skills. Moderated by student leaders and experts, the sessions addressed critical topics such as technology, sustainability, and personal development. Below is a summary of the sessions:

**Session Recaps:**

1. Introduction and Open Discussion
   Date: September 1, 2023
   Moderator: Abdullah Tahsin, 1st Year, Department of Mechanical Engineering, De Montfort University, Dubai.
   Brief: An open forum where students shared their goals and set expectations for the upcoming leadership sessions.
2. Preparing for Success and Inclusive Education
   Date: September 15, 2023
   Moderator: Abdullah Tahsin, 1st Year, Mechanical Engineering, De Montfort University, Dubai.
   Brief: Covered strategies for academic success, the effects of parental conflict on children, and the benefits of inclusive education for autistic students.
3. Safety, Health, and Extracurricular Activities
   Date: September 29, 2023
   Moderator: Rayhan Ahmed, Grade 12, Al Ain Juniors School, UAE .
   Brief: Highlighted the importance of obeying traffic rules, maintaining a healthy diet, and participating in extracurricular activities for well-rounded development.
4. Friendship, Science & Technology, and Aspirations
   Date: October 13, 2023
   Moderator: Ragib Nihal Sadab, Grade 12, International School of Choueifat, UAE.
   Brief: Explored qualities of good friendship, overcoming the challenges of science and technology, and students' dream professions.
5. Cultural Respect and Reading Preferences
   Date: October 27, 2023
   Moderator: Abdullah Tahfim, Grade 11, Progressive English School, Sharjah.
   Brief: Discussed the importance of cultural respect, the value of general knowledge, and preferences between physical books and e-books.
6. Homework, Environment, and Time Management
   Date: November 10, 2023
   Moderator: Sariyah Bint Shamiul, Grade 6.
   Brief: Debated daily homework's necessity, ways to ensure a greener environment, and strategies for effective time management.
7. Social media, Teamwork, and Technology’s Impact
   Date: November 24, 2023
   Moderator: Abdullah Tahsin, 1st Year, Mechanical Engineering, De Montfort University, Dubai.
   Brief: Discussed social media for children, the value of teamwork, and whether technology makes people less social.

8. Video Games, Humility, and Deforestation
   Date: December 8, 2023
   Moderator: Abrar Bin Murshed, Grade 8, Good Will Children PVT School, Abu Dhabi.
   Brief: Analyzed the effects of video games on children, the importance of humility, and strategies to combat deforestation.
9. Artificial Intelligence and Respectful Disagreement
   Date: December 22, 2023
   Moderator: Rayhan Ahmed, Grade 12, Al Ain Juniors School, UAE.
   Brief: Discussed the prospects and challenges of AI, the importance of respectful disagreement, and ways to improve the leadership program.
10. Online Safety, Empathy, and Exam Debate
    Date: January 5, 2024
    Moderator: Ragib Nihal Sadab, Grade 12, International School of Choueifat, UAE.
    Brief: Focused on responsible internet use, the significance of empathy, and debated whether exams should be eliminated until Grade 8.
11. Team Leadership and Open-Mindedness
    Date: January 19, 2024
    Moderator: Abdullah Tahfim, Grade 11, Progressive English School, Sharjah.
    Brief: Addressed strategies for forming effective teams and the importance of open-minded communication.
12. Hard Work vs. Talent
    Date: February 2, 2024
    Moderator: Sariyah Bint Shamiul, Grade 6.
    Brief: A lively debate on whether hard work and grit are more crucial for success than innate talent.
13. Fairness and Building Happy Communities
    Date: March 1, 2024
    Moderator: Rapangel Arin Yana, Grade 5, Global English School, UAE.
    Brief: Highlighted the role of fairness and practical steps to create a cohesive and happy community.
14. Does Social Media Stifle Creativity?
    Date: March 15, 2024
    Moderator: Sariyah Bint Shamiul, Grade 6, Rosary School, Sharjah.
    Brief: Debated whether social media limits creativity among young individuals.
15. The Importance of Non-Academic Reading
    Date: March 29, 2024
    Moderator: Tahmeed Ahmed, Grade 9, Islamiya English School, Abu Dhabi.
    Brief: Emphasized the value of reading beyond academics and introduced key influential books and their authors.
16. The Importance of Non-Academic Reading
    Date: March 31, 2024
    Moderator: Abdullah Tahfim, Grade: 12, Progressive English School, Sharjah (PESS), UAE.
    Brief: Discussed the value of non-academic reading and highlighted influential books and authors.
17. Overcoming Cognitive Biases
    Date: April 19, 2024
    Moderator: Abdullah Tahsin, 1st Year, Mechanical Engineering, De Montfort University, Dubai.
    Brief: Discussed cognitive biases, their effects on attitudes, and strategies to overcome them.

18. Cyberbullying Awareness and E-Safety
    Date: April 21, 2024
    Moderator: Radiah Mubasshira Khan Afsa, Grade 7, Islamiya English School, Abu Dhabi.
    Brief: Addressed the risks of cyberbullying and shared practical tips for ensuring e-safety for teenagers.
19. The Scopes and Impacts of Artificial Intelligence
    Date: May 3, 2024
    Moderator: Rayhan Ahmed, Grade 12, Al Ain Junior School, UAE.
    Brief: The session explored the broad applications of artificial intelligence, highlighting its potential opportunities and threats posed by AI domination.
20. AI Opportunities and Threats for Junior Students
    Date: May 5, 2024
    Moderator: Syed Elham Naser, Grade 6, Ambassador School, Sharjah, UAE.
    Brief: Focused on introducing AI concepts to younger students, including its potential benefits and challenges in today's digital world.
21. Debate: Climate Change as the Topmost Global Priority
    Date: May 31, 2024
    Moderator: Murtazaa Tanbeer Ahmed, Senior Application Developer, National Ambulance UAE.
    Brief: A passionate debate between Team A (supporting climate change as a top priority) and Team B (opposing), exploring the urgency of addressing environmental issues.
22. Debate: Emotional Intelligence vs. Cognitive Intelligence (Senior Group)
    Date: June 21, 2024
    Moderator: Samsun Nahar Nupur, BA Hons, MA B.Ed., Sharjah Ambassador School.
    Special Guest: K.M. Musaddeque Ullah Munna, DGM, Rangs Electronics Limited.
    Brief: Students debated whether emotional intelligence holds greater importance than cognitive intelligence in personal and professional success.
23. Debate: Emotional Intelligence vs. Cognitive Intelligence (Junior Group)
    Date: June 23, 2024
    Moderator: Sariyah Bint Shamiul, Grade 6, Rosary School, Sharjah, UAE.
    Chief Guest: Dr. M. Mehedy Masud, Professor, College of IT, UAE University.
    Brief: A discussion tailored for younger students on the role of emotional intelligence and its advantages over cognitive skills in leadership and teamwork.
24. Eliminating Water Pollution and Ensuring Clean Water (Senior Group)
    Date: July 5, 2024
    Moderator: Samsun Nahar Nupur, BA Hons, MA B.Ed., Sharjah Ambassador School.
    Special Guest: Bulbul Ahmed Mukul, President, Greater Faridpur Association, UAE.
    Brief: Students discussed actionable social activities and initiatives to combat water pollution and promote clean water availability.
25. Book Review: *The Art of Thinking Clearly* – Author: Rolf Dobelli
    Date: July 19, 2024
    Moderator: Samsun Nahar Nupur, BA Hons, MA B.Ed.
    Brief: A thought-provoking session reviewing Rolf Dobelli's book, emphasizing strategies to identify and overcome common cognitive biases.
26. Eliminating Water Pollution (Junior Group)
    Date: July 21, 2024
    Moderator: Nuzhat Mahdiyat, Grade 12, The Westminster School, Dubai.

Brief: A session encouraging young students to propose creative solutions for reducing water pollution and ensuring clean water access.

27. Book Review: *Dopamine Detox* – Author: Thibaut Meurisse (Senior Group)
    Date: August 2, 2024
    Moderator: Samsun Nahar Nupur, BA Hons, MA B.Ed.
    Special Guest: Engr. Md Ashraful Alam PMP, Lead MEP Engineer, BEAWorld Organizer.
    Brief: Discussed the insights from *Dopamine Detox* and its practical applications in improving focus and productivity.
28. Book Review: *Dopamine Detox* – Author: Thibaut Meurisse (Junior Group)
    Date: August 4, 2024
    Moderator: Nuzhat Mahdiyat, Grade 12, The Westminster School, Dubai.
    Honorable Guest: Engr. Rafiqul Islam Talukder P.Eng., Advisor–BEAWorld.
    Brief: Tailored for younger audiences, the session explored key concepts from *Dopamine Detox*, focusing on managing distractions in a digital age.
29. Discussion: What is Your Target Profession and Why?
    Date: October 25, 2024
    Moderator: Samsun Nahar Nupur, BA Hons, MA B.Ed., Sharjah Ambassador School, UAE.
    Brief: Students shared their career aspirations, discussing the importance of setting professional goals and the steps to achieve them.
30. How Does Energy Efficiency Contribute to Sustainability?
    Date: November 8, 2024
    Speaker: Abdullah Tafhim, Grade 12, Progressive English School, Sharjah.
    Moderator: Numaira Iram, Grade 9.
    Brief: Focused on the role of energy-efficient technologies in promoting sustainability and reducing environmental impact.

**Feedback and Outcomes:**

The sessions successfully provided a platform for students to express ideas, learn collaboratively, and develop leadership skills. Participants praised the interactive discussions, highlighting their role in fostering communication, critical thinking, and teamwork.

For more details on future sessions or to revisit past discussions, please visit our official website or group links.

# BEAWorld Champion Award-2024

We are happy to announce BEAWorld Champion Award-2024 as recommended by Search Committee headed by Engr. Moazzem Hossain.

1. Prof. Dr. Ainun Nishat- Most Inspiring Personality of the Year

Outstanding Presenter -2024
1. Engr. Akhtar Zaman P. Eng
2. Prof. Dr. Md. Khasro Miah
3. Prof. Dr. M. Mehedy Masud

Subject Category:
4. Engr. Md. Al Emran Hossain - Sustainability Champion
5. Dr. Md. Easir Arafat Khan - Process Safety Champion
6. Engr. Shawkat Ali Khan - Structural Engineering
7. Engr. Ashraful Islam - MEP Champion

Special Award: Student Leadership Program
1.Samsun Nahar Nupur

Congratulation to Champion Award Winners -2024

Finally, I on behalf of BEAWorld extend my cordial thanks to Search Committee for your valuable efforts.

Best Regards
Engr. Rafiqul Islam Talukder
Chief Editor