Dedicated Freight Corridors

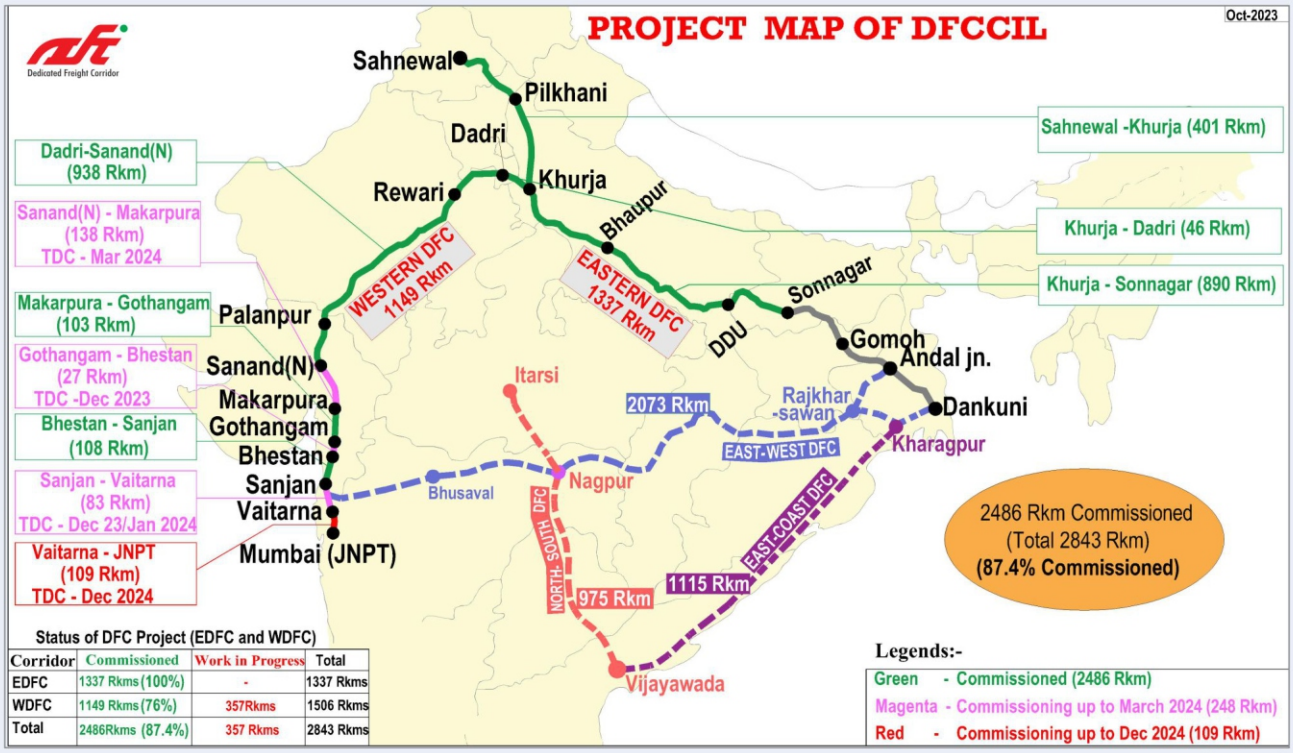
Game Changer

in India's freight transportation

Issue 02, October 2023

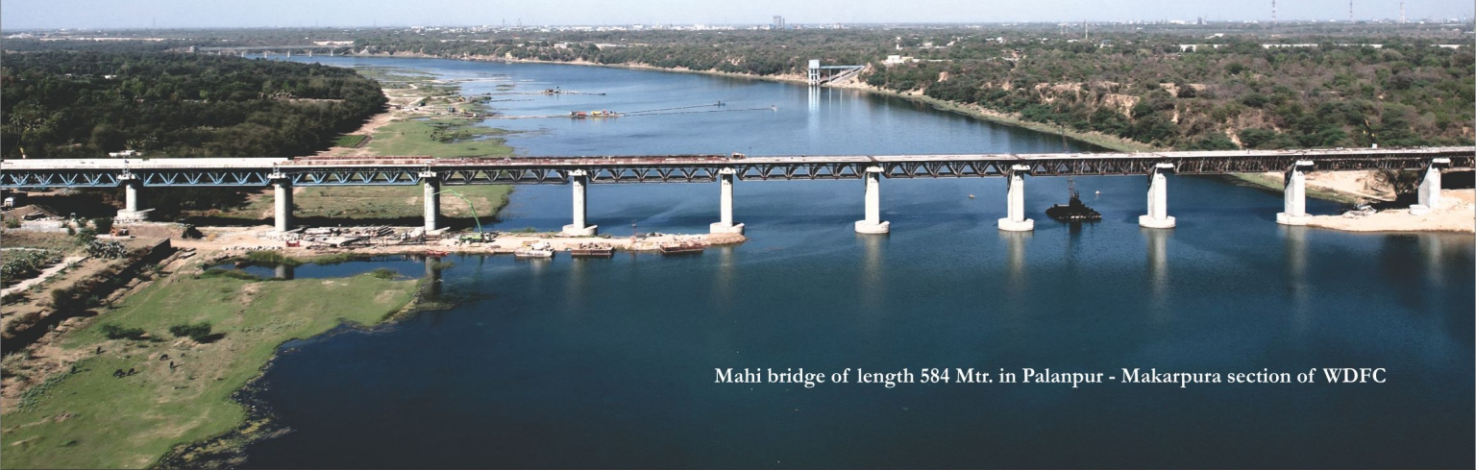
> "Both the EDFC and WDFC are being seen as a game changer for 21st century India"
>
> **- Shri Narendra Modi**
> Hon'ble Prime Minister

Operational Control & Command Centre, Ahmedabad



Not to scale

- **2486 kms** (87.4%) of DFCCIL have been completed.
- EDFC **100% commissioned.**
- More than 1.3 Lakh trains were operated over commissioned section.
- Remaining will be completed by March 2024 (except 109 kms. of Vaitarna-JNPT).
- Continuous connectivity of 1875 kms. got achieved by connecting Sonnagar with Sanand.
- Hon'ble PM dedicated DDU - Sonnagar section on July 2023 of EDFC to the nation.



Mahi bridge of length 584 Mtr. in Palanpur - Makarpura section of WDFC

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From the Editor's desk

Ravindra Kumar Jain
Managing Director, DFCCIL

Dear Readers,

It gives me immense pleasure to bring you the second edition of "Game Changer," the official magazine of the Dedicated Freight Corridor Corporation of India Limited (DFCCIL). I am thrilled to present this edition, which focuses on the remarkable innovations employed in the DFCCIL project.

Innovation has always been the cornerstone of progress, and DFCCIL stands as a testament to this belief. Our journey to revolutionize freight transportation in India has been nothing short of extraordinary. Since our inception, we have strived to challenge conventional norms and embrace ground-breaking technologies to create a future-ready infrastructure for the nation.

The articles featured in this edition will take you through a myriad of innovations that have shaped the DFCCIL project. From state-of-the-art signalling & control systems to advanced track and OHE construction mechanisms, each aspect of the project has been meticulously planned and executed with innovation at its core. These innovations have not only enhanced the safety and efficiency of freight transportation but have also given great pace to our project.

One of the key areas where innovation has played a pivotal role is in our communication systems. The DFCCIL project has integrated cutting-edge technologies to establish centralise control in Operational Control & Command Centre at Prayagraj and Ahmedabad. This has not only enabled real-time monitoring and control but has also facilitated timely decision-making, thereby enhancing the overall operational efficiency and reliability. Another remarkable innovation that deserves special mention is the adoption of advanced Track Construction Machines and Automatic Wiring Trains. DFCCIL has employed state-of-the-art machinery and techniques to ensure the highest standards of asset quality and reliability.

Apart from technological innovations, this edition also showcases the human-centric approach DFCCIL has adopted. Our commitment to fostering a culture of innovation extends to our workforce as well. We have empowered our employees to think creatively and encouraging them to bring forward ideas that drive positive change. By nurturing a culture of innovation and continuous learning, DFCCIL has created an environment where our employees feel motivated to explore new frontiers and push boundaries.

As we embark on the second edition of "Game Changer," I would like to express my deepest appreciation to all the individuals and teams who have been instrumental in making DFCCIL a beacon of innovation. Their dedication, passion, and unwavering commitment to excellence have been instrumental in transforming the Indian freight transportation landscape.

I extend my gratitude to our readers for their unwavering support and interest in the DFCCIL project. It is your enthusiasm that continues to drive us forward and fuels our determination to explore new horizons.

Wishing you an enlightening and inspiring reading experience.

Ravindra Kumar Jain

DFC Milestones

April 2005
Project announced by Hon'ble Prime Minister & Hon'ble Minister for Railways.

Feb 2006
CCEA gave in-principle approval for the project based on the RITES Report.

Sept 2006
EDFC foundation laid by the then Hon'ble Prime Minister Sh. Manmohan Singh at Ludhiana.

Oct 2006
WDFC foundation laid by the then Hon'ble Prime Minister Sh. Manmohan Singh at Mumbai.

Oct 2006
Incorporation of DFCCIL (Schedule "A") Government Company, as SPV.

Nov 2007
CCEA gave in-principle approval along with permission for under-taking preliminary works including land acquisition.

Sept 2009
Cabinet approved JICA loan for WDFC along with STEP loan conditionalities.

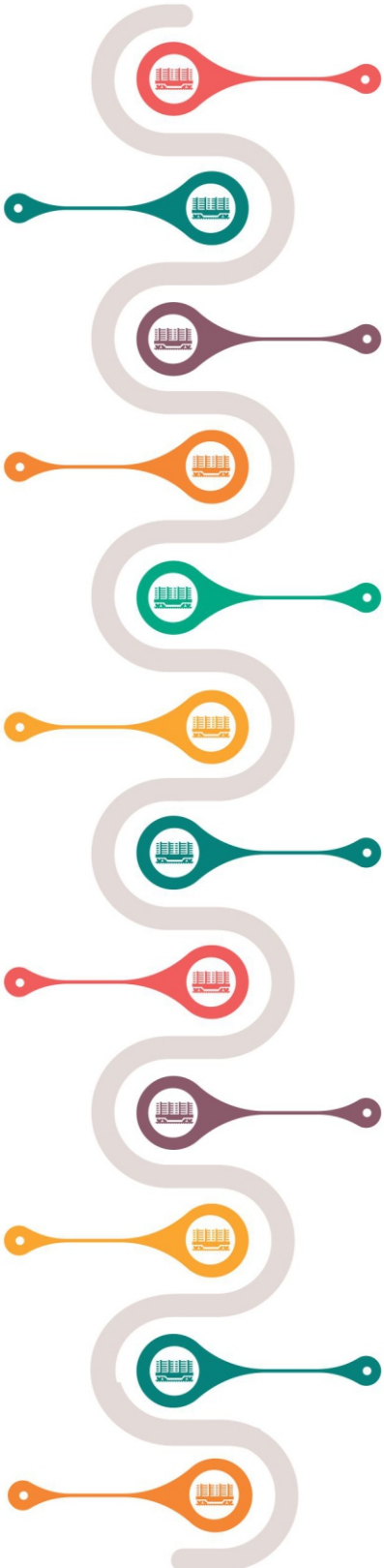
Oct 2011
Loan Agreement with World Bank for USD 975 Million (Rs.5850 Cr) signed for EDFC-1 (Khurja-Bhaupur).

Jan 2013
First Civil, System & Track Contract (Bhaupur – Khurja) – EDFC worth Rs.3267.54 Cr awarded.

Feb 2014
Concession Agreement between DFCCIL & MoR signed.

Dec 2020
Hon'ble Prime Minister Sh. Narendra Modi inaugurated Khurja - Bhaupur (351 km) section of EDFC.

Jan 2021
Hon'ble Prime Minister Sh. Narendra Modi inaugurated Rewari - Madar section (306 km) of WDFC.



Mar 2021

Trial run of freight train in Madar-New Palanpur section (353 km) of WDFC Trial run of Electric Locomotive was conducted in Ganjkhwaja - Chirailpathu section (100 km) of EDFC.

Aug 2021

Truck on Train (ToT) service started from New Rewari (Haryana) of WDFC.

Oct 2021

Madar-Palanpur (353 km) section was declared open for operation.

Dec 2021

Public Private Partnership Appraisal Committee (PPPAC) has given approval for the First Mega Infrastructure project of Railway PPP project in Sonnagar-Gomoh section on hybrid DBFOT model.

Feb 2022

Trial run of freight train in Rooma-Shujatpur section (130 km) of EDFC.

Mar 2022

New DDU to New Sonnagar (137 km) section and New Rooma to New Sujatpur section (130 km) of EDFC were commissioned.

June 2022

Hon'ble Prime Minister Sh. Narendra Modi inaugurated Madar- New Palanpur (353 km) of WDFC on 18.06.2022.
Training facility for employee of DFCC was started at Heavy Haul Institute, Noida.

Sept 2022

Hon'ble Prime Minister Sh. Narendra Modi inaugurated New Palanpur - New Mehsana including Palanpur connecting line (75 km) of WDFC on 30.09.2022.

Mar 2023

Rewari-Dadri (127 km) of WDFC, Khurja-Khatauli (134 km) & New Dagmagpur - New Ahraura Road (23 km) of EDFC were commissioned.

July 2023

Hon'ble PM dedicated DDU - Sonnagar section of EDFC on 07.07.2023 to the nation

October 2023

Sahnewal -Khatauli section (267 km) was commissioned. With this commissioning EDFC is now completed.

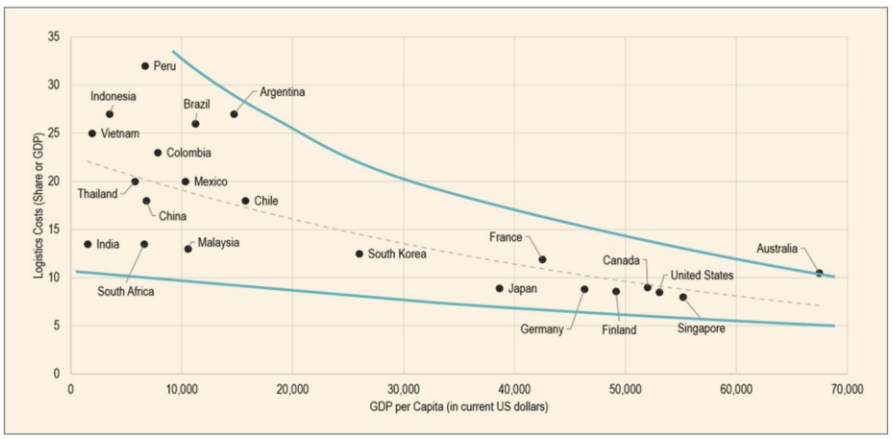
October 2023

Makarpura-Gothangam (103 km) commissioned on 24.10.2023 of WDFC

DFC: Transforming Transportation

Mukul Saran Mathur
PED (Infra.)/R.Board

A lot has been written on the importance of Indian Railways which works day in day out as the lifeline of this nation. Whatever be the time or situation, the wheels of railways are always in motion carrying this country over its shoulders. Indian Railways has always enjoyed great patronage from the people of this country. Even after the great developments in modes of airways and roadways, Railways is considered as the transport of choice for a large segment of our countrymen. Over the years, Indian Railways has served our country well but with changing times and increasing demands of rising economy asks for significant reforms and infrastructural developments in railway sector. Since independence, we saw modal share of railways in freight transport gradually wane. From more than 70% in 1950s, the modal share of railroad has now come down to around 26%. The reason behind this is not only the tremendous growth of road network but also lack of capacity building in railway infrastructure and relatively higher freight tariff charged over Indian Railways. It is a well-known fact that freight earnings are used to subsidise the passenger train operations over Indian Railways. To meet the increasing operation expenses, the freight tarrifs have increased tremendously in India and making it one of the highest in the world.



Source: World Bank for GDP data. Various sources for logistics costs.

As seen from above figure, there is a relationship between the level of economic development (as measured in terms of GDP per capita) and logistics costs. The developed countries have lower logistics costs which makes their products more competitive, while developing nations struggle with higher logistics costs which reflects poor infrastructure and put these countries at a significant disadvantage. Logistics costs amount to around 15% of delivered costs in India, while it can go as low as 8% in developed economies. This trend calls for immediate attention to infrastructure development which can bring logistics costs down. As a major transporter which has inherent advantages of scale and connectivity, railway has a major role to play in it.

However, major infrastructure development in Railways has remain muted. The trend of operating ratio of Indian Railways has been on the rise since many years. High operating ratio indicates that the Indian Railways is spending more money on operations than it is earning from operations which is a sign of financial difficulty.

High financial burden of salaries and pensions put adverse pressure on the operating ratio of Indian Railways which leaves almost negligible operational surplus to carry out any significant infrastructural development. Budgetary support received from the government is spent mainly on regular upkeep of ageing assets or in small railway projects which adds up miniscule track capacity.

In such a scenario, a mega railway infrastructure project like Dedicated Freight Corridors was conceived along the over congested Golden Quadrilateral with the help of funding from international agencies like JICA and World Bank. This is the biggest infrastructure project ever attempted by Indian Railways in independent India. It aims to improve the efficiency of freight transportation by building a dedicated railway network capable of carrying larger, longer, and faster freight trains. Equipped with modern signalling and safety systems, this rail network is supposed to handle high-speed freight trains which will increase overall through put, increase wagon, crew utilization and reduced congestion over Indian Railway network. The overall objective of this project is to bring down logistics cost over railways by capitalizing on the operational efficiency this dedicated network will offer. It will not only attract freight traffic towards railways but well-equipped with the help of MMLPs & PFTs along with its network, it will provide a complete transport solution to its customers. DFCs will also prove to be a green mode of transport. With 100% electrified network, the carbon footprint of transit through DFC will be very less in comparison to roadways. As per a study carried out by Ernst & Young, DFC will save emission of around 457 million tons Carbon Dioxide into the atmosphere over a period of next 30 years.

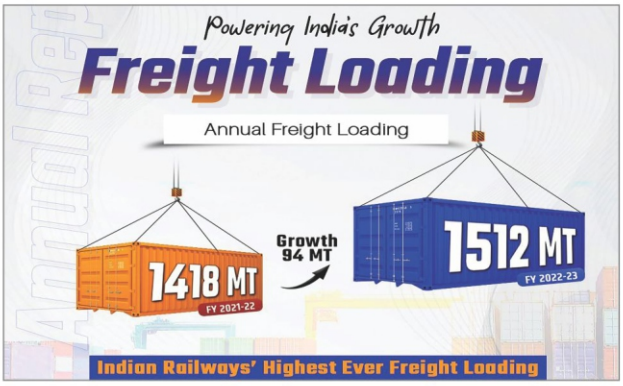
The project consisted of two corridors, the Eastern Dedicated Freight Corridor (EDFC) and the Western Dedicated Freight Corridor (WDFC), which together cover a total distance of 2,843 kilometres. On its commissioning, Northern Railway, North Central Railway, East Central Railway, North Western Railway and Western Railway will be the main beneficiary as it will decongest IR network and provide capacity to run passenger trains efficiently and punctually. It will also contribute towards health and safety of the railway assets as availability of maintenance blocks will enhance the moment freight traffic is shifted over DFCs.

As on date, DFCCIL has commissioned more than 87% of the total DFC network and freight train operations is taking place on them. Since the start of its commissioning in 2020, the DFCs have run more than 1.3 lakh trains and handled over 100 billion tonnes of freight. The DFCs have also helped to reduce congestion on the existing railway network, and they have made it possible for Indian Railways to increase its freight capacity.

The DFC project has been welcomed by trade and industrial sector of India. The project has been praised for its potential to boost economic growth and create jobs in its vicinity. There has been demands for new DFCs in other parts of India. Dedicated freight corridors have formed the backbone of PM Gati Shakti Master Plan as several Industrial parks and economic zones are coming up around it. States are also planning new developments along Dedicated Freight Corridors to take greater advantage of connectivity this project is offering.

Here are some of the benefits that Indian Railways has received after the commissioning of the DFC project:

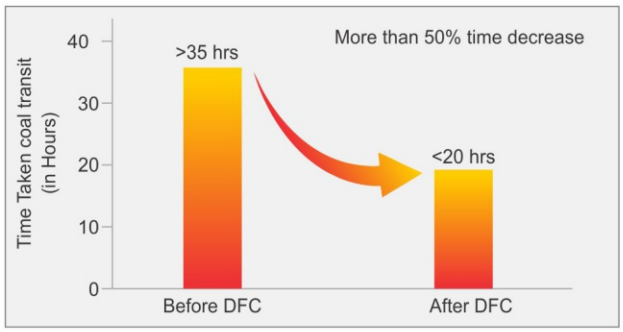
- **Increased freight capacity :** The DFCs have helped to increase Indian Railways' freight carrying capacity by up to 50%. This has led to a reduction in congestion on the existing railway network. Even with limited opening of DFC network, zonal railway in the vicinity of DFC has observed increase of around 30% in the average number of daily freight trains.



- **Higher Speeds :** DFCs allow freight trains to travel at speeds of up to 100 kmph. This has led to a reduction in travel time for freight trains, which has made it more efficient to transport goods by rail. Average speed of freight trains observed on DFC is more than 50 kmph which is a considerable improvement in the average speed of freight trains over IR network. The average speed of freight trains could be further improved once changeover points are streamlined and lobbies over DFC network become functional.
- **Better operational efficiency :** DFCs has shown tremendous performance in operational efficiencies.

Locomotive utilization on DFC network, which is measured as engine km per day, is more than twice that on IR network. This factor also leads to lesser number of crew change which is required to cover a distance. This brings saving in energy costs as well as manpower costs in train operation. Higher speeds and longer runs also result into shorter wagon turn around time. This means lesser number of wagon requirement to carry freight traffic and efficient utilization of wagons leading to savings in capital expenses. The benefit of DFC is reflecting in the increased through put of terminals and railway sidings observed over last one year.

- **Innovative services:** DFC is designed to run long haul trains which double the length of trains running on IR network. Similarly, Double stack container trains can be run on Western DFC due to high rise OHE based traction. There has been considerable increase in the number of Double stack container trains and long-haul trains run by IR. With full upgradation of feeder routes on IR network, this number will increase even further in future. DFC also ran Truck on Train services where loaded trucks are transported using flat wagons. This service has found enthusiastic response from the transporters since it causes significant savings in time, fuel, and manpower costs and at the same time reduces road congestion and pollution.
- **Faster movement of essential traffic:** After commissioning of EDFC, the coal movement has seen significant jump. The coal loaded train which used to take 35-40 hrs to reach from coal belt regions to power plants are now taking less than 20 hrs. It has not only resulted in reliability in power supply but has also resulted in significant cost saving in inventory cost as power plants now have to maintain strategic reserves for less time period.



Coal transit time comparison

Similarly, commissioning of Dadri-Palanpur section of WDFC has given big boost to the EXIM traffic. The travel time from ports to NCR region has came down to less than 20 hrs.

- **Development of Freight Terminals (FT) & Multi-Modal Logistics Parks (MMLP):** DFCCIL had invited Expression of Interest for developing Gati Shakti Cargo Terminal (GCT) at 112 stations of DFC. The first GCT at New Rewari has recently been opened and has led the way for many more to come. DFCCIL has also notified 27 Goods sheds and inviting the next bid for development of Goods shed on PPP model.

The DFC project has been successful in delivering on its objectives and is proving to be A **GAME CHANGER** in the field of logistics sector. The project has improved the efficiency of freight transportation by rail and proving to be a major contributor for achieving the targets of Mission 3000 MT by the year 2030. DFCs are expected to be the backbone of the railway freight transport and are likely to be a major asset to India for many years to come.

Double Stack Container Train

Western Corridor's Operation Control Centre (OCC)

V.B. Mathur
GGM/S&T/ WC

The Operation Control Centre (OCC) at Ahmedabad came into operation recently on 23 March 2023. The OCC acts as the command centre for the entire route length of 1504 route KM of Western Dedicated Freight Corridor, which connects Dadri in Uttar Pradesh to Jawaharlal Nehru Port in Mumbai and will traverse through the state of Uttar Pradesh, Haryana, Rajasthan, Gujarat and Maharashtra.

The control centre at WDFC Ahmedabad is a remarkable feat of modern engineering and design, incorporating both aesthetics and functionality to establish itself as one of the most impressive control rooms in the country. Besides having state-of-art TMS, SCADA & communication systems for monitoring & managing the train operations, OCC/ Ahmedabad boasts of having great & visibly appealing interiors. It has been appreciated by one & all and even created a kind of buzz in Railway fraternity.

Conception & Challenges

Lot of brainstorming was done during conception of finishing & interior work of OCC. Number of challenges were in consideration for optimizing the utilization of available space for allocation of utilities, installation of equipment & systems specially in D-portion of OCC. For finalisation of video wall sizing, controller seating arrangement, consoles requirements and above aspects were discussed, deliberated & finalized during the planning stage among all stakeholders before incorporating these inputs in the design of OCC.

As the Control centre is the place where critical operations take place, aspects like aesthetics, ergonomics, acoustics, lighting, modularity, maintainability, seismic & fire safety considerations as per national / international standards were also considered. Hence, a leading specialized agency having an adequate experience in control room solutions was engaged for designing & execution of OCC theatre interior work.

Design Philosophy for Control Room

Every control room possesses unique requirements governed by the Human Machine Interface. Operators hold key importance within the control room, and thus, their interaction with the machinery becomes the prime focus. All design aspects, including viewing angles, lux levels, lighting placement, HVAC, fire safety, traffic patterns, and furniture design have been meticulously considered for the functional needs of the control room.

The following aspects were also considered during the design process:

- Space Planning, Functionality, and Interaction among different packages / stakeholders
- Continuous Operability

- Safety
- Healthier Working Environment
- Aesthetical Appeal

The control room interiors have been designed with an extraordinary concept. To ensure adequate lighting and enhance the aesthetic appeal of the facility, a unique arrangement of continuous concentric diffused lights has been incorporated.

To address the potential issue of screen reflections on the large display wall, we have even used membrane ceilings. These ceilings eliminate glare and reflections while their 3D design offers an exceptional view of the control room.

Both sets of lights are equipped with dimmable features, allowing the lux level to be easily controlled through a controller. This enables the maintenance of the desired lux level within the facility.

Aesthetics:

Aesthetics dealing with art, beauty, and taste plays a vital role in the control room, which serves as the heart of operational activities. The control desk itself should reflect aesthetic appeal. Moreover, an aesthetically superior environment not only enhances the overall atmosphere but also influences the body language and mindset of individuals working within it. The goal is to provide users with a comfortable, relaxed, and focused mindset within the control room ambience, contributing to their objectives with enhanced performance.

Designed in compliance with ISO 11064:

The control room prioritizes the operator's ability to perform tasks with minimal neck and head movements, thus minimizing the risk of neck strain during prolonged working hours. Efficient lighting and lux levels have been incorporated to facilitate effective information communication.

The control room operates 24/7, requiring operators to work with optimal efficiency without experiencing fatigue. The control room environment follows the principles of "Human Factor Engineering." Illumination levels within the control room, for example, have been designed to enhance operator performance, combat fatigue and reduce stress levels. Proper calculations of lux ensure the appropriate distribution of light with intensity and reflectance parameters affecting operator operations.

Ergonomic & Acoustic Compliance:

The control desks are arranged in a manner reminiscent of an amphitheatre to ensure that each operator enjoys an unobstructed view of the large video screen, regardless of the operator seated in the front row.

To minimize the impact of unwanted noise generated by people and chair movement within the control room and the false flooring tiles have been provided with a top layer of acoustical laminate finish. This finish is designed to reduce noise according to **ISO 717-2 standards,** effectively reducing the overall noise level in the control room.

Micro perforated tiles have been utilized for the ceiling and paneling, allowing the control room to achieve optimal acoustic levels without compromising the overall ambience of the facility. These tiles effectively address acoustic concerns without creating a visually dark or negative impression on the walls or ceilings.

CRB & CEO, Railway Board inspecting OCC, Ahmedabad

Safety :

Safety is of utmost importance, and all design components in the control room adhere to **ASTM E84 standards.** It ensures that they do not pose a fire hazard as well as generate smoke in an unlikely case of fire. **The ceiling and panelling systems are compliant with IS 1893 to sustain seismic vibrations.**

The cable routes have been suitably designed to prevent fire hazards. All necessary measures have been adopted to prevent the creation of hazardous conditions arising out of overheating and/or ignition of cables. Fire-retardant, low-smoke and halogen-free/low-halogen materials cables are used as per relevant specifications.

Interior works of OCC in progress

Healthier Environment:

The control room design takes into account the emission of Volatile Organic Compounds (VOCs), which can lead to respiratory diseases and cancer. VOC-free materials or materials within permissible VOC limits are utilized in the control room, following the practices employed by individuals in the UK, USA, and the Middle East. The control room has been designed with Greenguard Gold Certified material thereby providing a healthier facility to the stakeholders.

Sustainability and Maintenance-Free:

The control room is a mission-critical facility that cannot afford shutdowns once operational. Therefore, the design considers retrofitting and preventive maintenance without requiring any shutdowns. This ensures a sustainable and maintenance-free control room design.

Every single panelling and ceiling tile is completely modular, offering the advantage of easy access to services located above the ceiling and behind the paneling. This flexibility enables convenient maintenance and replacement of damaged tiles, even though such damage is highly unlikely during regular operations. These features ensure that ongoing work is not disrupted during any necessary repairs or replacements.

Functionality:

The control room has been designed to handle a range of contingencies, incorporating two war rooms to address minor issues without disrupting main control room operations. In case of emergencies, the boardroom is available within the control room, minimizing the need to leave the main control room.

Control Room Consoles:

The control desk solution has been meticulously engineered to adhere to rigorous standards, specifically conforming to the ergonomics codes outlined in **ISO 11064: Part 4.** Its environmental impact has been thoroughly assessed throughout its entire life cycle, ensuring compliance with cradle-to-grave analysis and earning LCA & EPD certification.

To guarantee long-lasting durability, the structure has been designed to withstand the rigorous BIFMA X5.5: 2014 tests. Additionally, the slat wall is equipped with the capability to accommodate the installation of an acrylic sheet above it, providing further versatility and customization options.

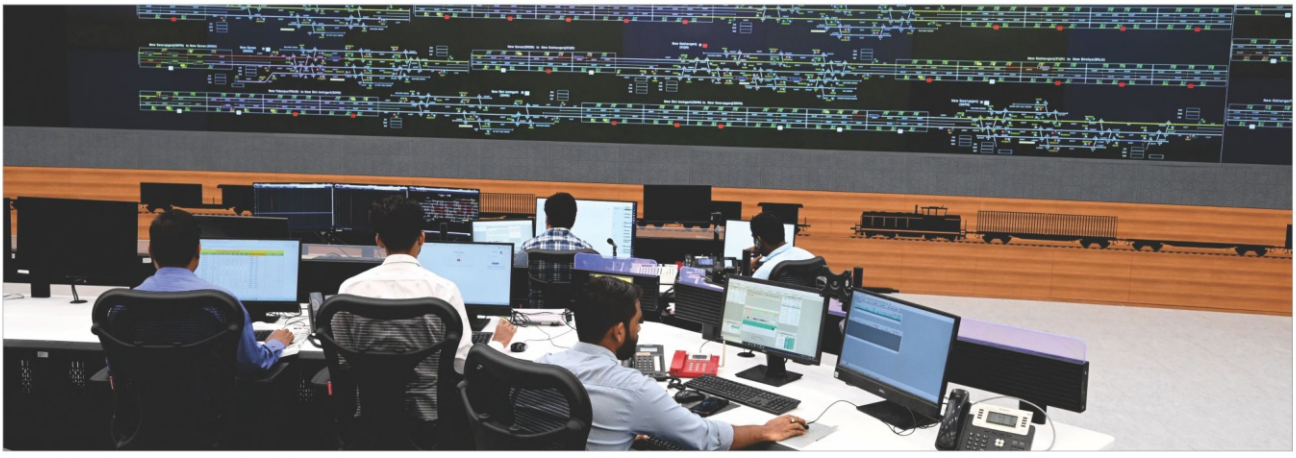
All the consoles are equipped with a front modular removable Polyurethane edge to address the frequent contact between this component and the operator. The incorporation of a soft polyurethane edge is an essential ergonomic feature, designed to prevent operator injury during emergencies by minimizing the impact of accidental contact and reducing contact stress.

In the event of damage to this edge, the desk design allows for swift and effortless replacement within just thirty minutes, without the need for any shutdowns or removal of the tabletops. This ensures minimal disruption and maintains operational efficiency during the replacement process.

In order to facilitate effective communication and situational awareness, the section controllers have been equipped with accent light control mechanisms. These mechanisms allow them to raise visual alarms within the control room, enabling the Chief Controller, positioned in the last top row and to quickly grasp the situation, if there is any. This feature enhances communication efficiency and promotes a swift response to critical events or conditions.

Conclusion :

In conclusion, the state-of-the-art control room at Ahmedabad in WDFC exemplifies the power of modern design and engineering. It offers operators a comfortable and efficient workspace while maintaining the highest standards of safety and functionality.



Traffic Monitoring from OCC, Ahmedabad

Innovations and New Technology in Electrification

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Abstract:

The increase in traffic density along with major Indian Railway routes and focus on increasing rail share of the freight traffic has necessitated the construction of dedicated freight corridors so that the existing saturated routes could be eased and bulk freight traffic can be run freight corridors.

Construction of dedicated freight corridors on design build lumpsum (DBLS) strategy has provided an opportunity to incorporate new technology in the works predominant with heavy haul freight railways and high speed trains across the globe. This article describes the salient features of the new technology items/innovations deployed in the electrification works.

Introduction:

Dedicated Freight Corridors have been conceived with heavy haul/long haul freight trains with trailing loads of the order of 6500/13000T. To meet the power demand, 2 x 25 kV AT feeding system has been adopted with following features not limited to:

- Power density greater then 1 MVA/RKM
- Auto Transformer for better voltage profile
- OHE conductor with enhanced mechanical/temperature withstand capabilities.
- Auto fault locator for faster discrimination/segregation of fault.
- Station SSPs for sectioning flexibility
- Internet protocol based SCADA system
- Monitoring of non-traction and signalling installations

Some of these items have been explained in detail in the following section.

1. 2X25 kV AT feeding system with high rise OHE

Fig. 1 : Double stack container train operation in WDFC

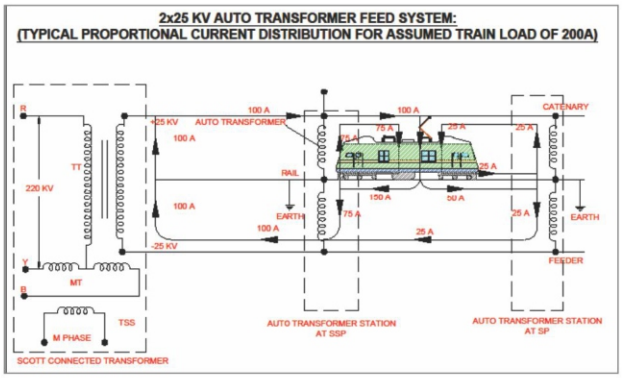


Fig. 2 : Circuit diagram

For electrification of DFC tracks, 2x25 kV AT feeding system has been adopted being the universal norm for high speed rail networks across the world. Sections over WDFC are provided with high rise OHE (about 2 meters higher than normal OHE) suitable for Double Stack Container (DSC) operation. Probably, for the first time in the world, DSC operation on flat wagons (max 7100mm MMD) has been conceived with contact wire height of 7.54 m. Recently, operation of triple stack container has also been successfully conducted over DFC route.

As per study conducted by UIC, electrical distribution efficiency for 2x25 kV is 97.6% against 92.95% efficiency in 25 kV system. Power density is approx.1 MVA/RKM in 2x25 kV system against 0.4 MVA/RKM in 25 kV system. Current distribution in typical 2x25 kV system is indicated in Fig.2.

The system offers following inherent advantages over 25kV conventional system :

- Operation of higher tonnage (6000/12000 Ton) freight trains at higher speeds.
- Double/triple Stack Container operation on flat wagons
- Reduced unbalance on the utility transmission network
- Higher spacing between sub-stations (60-90km)
- Better voltage regulation even at heavier loads
- Reduced inductive interference due to dedicated return path for currents.

Non-invasive rail earth clamp for earthing and bonding

Bonding and Earthing of all non-live metallic parts and structures in an electric traction based railway system is a mandatory/statutory requirement as per Indian Electricity Rule. In Indian Railways the rail potential is ensured by connecting the traction bond with the rail after drilling hole through the web of the rail. This method is invasive in nature and may affect the structural/metallurgical characters of the rails. The problem is more critical in heavy haul freight railways and high speed railway systems, on account of the high impact loads on the track structure.

Fig. 3: Existing practice in Indian Railways

Fig. 4: Rail clamp for bonding of Rails used in DFC project

To mitigate this problem, a new technique for effective rail-traction bond connection, by use of a rail-earth clamp has been developed in DFC project, thus eliminating drilling of holes in the rails. The clamp is rigidly fitted to the rails for effective passage of the designed short circuit current & is further connected to traction bond for limiting rail potential to safe limits during normal as well as faults.

Data Communication Unit (DCU) for monitoring AxT power supply at ALH/TH & Stations

In DFCCIL project, stations are approx.. 40 km apart and Auto Location Huts (ALH) & Telecom Huts (TH) are remotely located in block section aprox. 3 kms apart. The signaling & Telecommunication installations at these locations are fed from Auxiliary Transformer's (AxT) connected to UP & DN line OHE. There are instances of disruption to the supply due to blowing of DO fuse, cable faults & ACOS malfunctioning. ALH/TH being at remote locations in block sections, the failure may not be reported till batteries are drained and signals become dark. This adversely affects train operation.

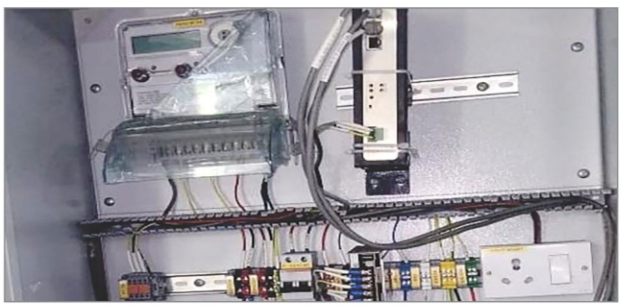


Fig. 5 : Data Communication Unit with energy meter

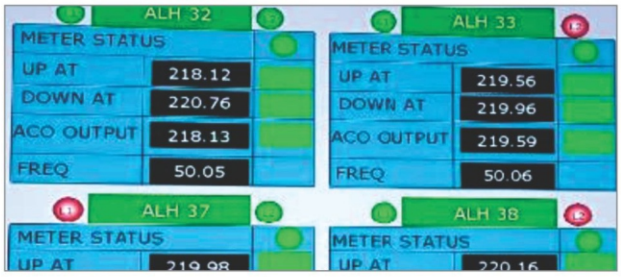


Fig. 6: AxT Supply Status at OCC

To avoid such instances, Data Communication Unit (DCU) has been provided to monitor the status of AxT supply at station room, ALH and TH locations at OCC. The DCU is a Remote Terminal Unit (RTU) which continuously monitors power supply from both AxTs and communicates the status to OCC on real time basis (Fig.6). In case of disruption of supply, information can be quickly relayed to field teams for faster response, avoiding battery drainages/signal blackouts

Adoption of Gas Insulated Switchgear (GIS)Technology

For the first time over Indian Railways (IR) GIS technology based switchgear has been commissioned at Kharbao, Maharashtra. This has resulted in avoiding infringement to DFCCIL alignment & saving of scarce space (about 80% saving w.r.t AIS substation). The substation has integrated power supply arrangement with IR to achieve economy in operation. This will be instrumental in initiating a quantum jump in innovation and technology in the field of Traction Sub-Stations in India where there is absolute space constraint.

Fig. 7 & 8 : GIS Sub-station at Kharbao

Non-Traction SCADA

In DFCCIL critical electrical assets at all stations (HT panel, DG, MDB, FACP etc) are being monitored through non-traction SCADA at OCC. This helps in faster response time to react to the disturbances in power supply system. The SCADA architecture and displays at OCC as indicated in fig.10 below.

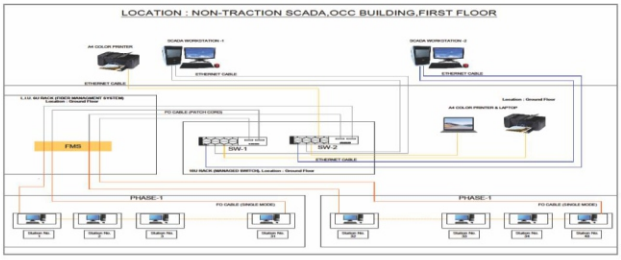


Fig. 9: Non-Traction SCADA Architecture

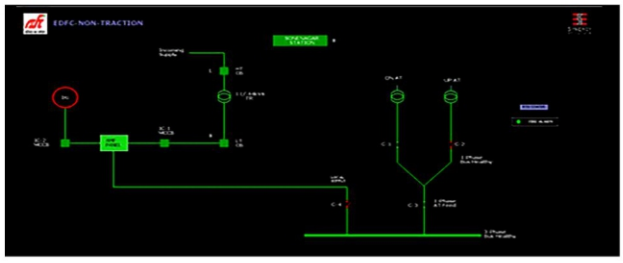


Fig. 10: Actual Status at OCC

Station SSPs for ease of sectioning and quick isolation of faults

In IR, typical block sections are approx.. 8-10 kms apart and sectioning of yards is done through manual isolators. In Western DFC works, where station spacing is about 40 kms Sub-Sectioning and Paralleling Posts (SSPs) have been provided on either side of the station to achieve sectioning. The SSPs have interrupters which are remotely monitored and controlled by SCADA at OCC. The SSP layout at New Ateli Junction Station is depicted in Fig.11 indicating Ateli North & South SSPs on either side of the station:

The interrupters at these SSPs control the feed to main and loop lines and offer following advantages:

- Each line can be remotely monitored and controlled
- Fault isolation is quick
- Sectioning for maintenance and breakdown are easily done
- Offers flexibility in train operation during normal and emergency situation

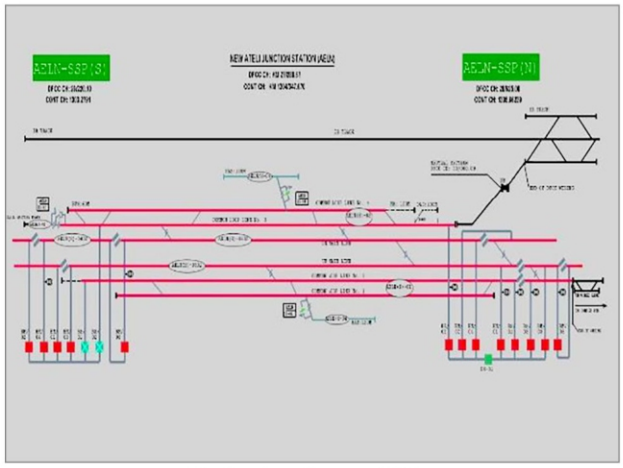


Fig. 11: Line diagram of SSPs

Enhanced Earthing and Bonding(E&B) Strategy

The earthing and bonding Code of Indian Railways was prepared at the time of commencement of 25 kV AC traction on Indian Railways about 55 years ago. DFCCIL having heavy haul freight network with track structure of 25/32 tonne, higher traction and fault current (12 kA) is not comparable to conventional 25 kV Electrified network of Indian Railways.

In DFCCIL,the design of E&B for PSI locations has been done by computerised 3D modelling using validated simulation software

E&B of the rails and other metallic structures along the tracks is achieved by provision of additional conductors viz. Aerial Earth Wire(AEW) & Buried Earth Conductor(BEC). Each mast is grounded by the AEW attached to it & also by the rails and BECs at transversal equipotential bonds every 450 m (fig.12).

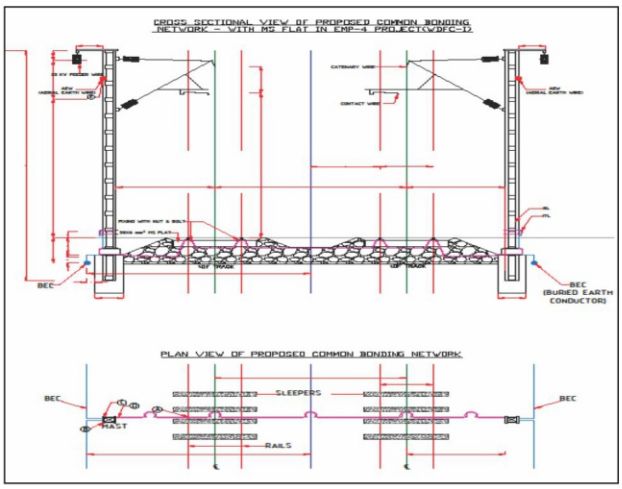


Fig.12 : Cross Section View of Bonding network

OHE Conductors

Indian Railways currently uses copper-cadmium alloy as catenary and HDGC conductor for contact wire. These are rated for 80°C with 600 A OHE current. To meet the heavy haul freight requirements and higher OHE currents (909 A), copper alloy conductor with temperature rating of 100°C (As per EN-50119) has been provided. Contact wire is Copper-Silver/Copper-Tin alloy (150sqmm) as per EN-50149 for enhanced conductivity and mechanical strength. Catenary (125/120 sqmm) is Copper-Magnesium alloy which is environmental friendly. Sizes of the conductors have been verified by Traction Power Simulation Study for temperature rise limits.

Fig. 13: OHE conductors

Modular Cantilever Assembly

Existing cantilever assembly being used in Indian Railways consist of galvanized steel tubes. The fittings in this cantilever are not interchangeable and are prone to rusting in polluted areas. In DFC projects modular cantilever assembly has been used in Bhaupur-Khurja & Rewari-Madar sections.

Main features of modular cantilever are:

- EN-50119 compliant design
- Interchangeable component
- Fittings made of Aluminium alloy, stainless steel & copper alloy resistant to corrosion
- Light and maintenance free design
- Easy fabrication/installation process

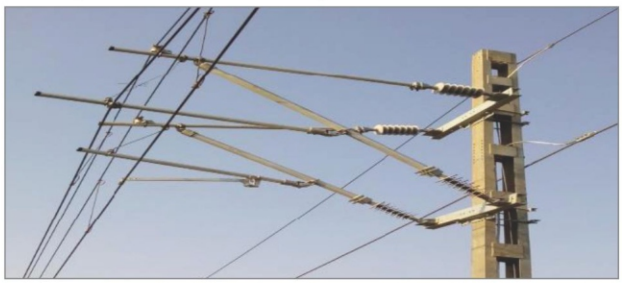


Fig. 14 : Modular Cantilever Assembly

Conclusion:

DFCCIL with concerted efforts has been able to incorporate new technology items in electrification works having proven service in international railways. Most of the items have been used for the first time over IR. The performance and experience gained over DFC will be a valuable technical input for future projects. Moreover, Indian Railways is also in the process of converting existing trunk routes to 2x25 kV system for running semi-high speed trains. These new technology items can be adopted by IR to achieve desired level of reliability & performance of PSI & OHE assets. This will be beneficial in creating an efficient railway infrastructure and achieving satisfaction of general public at large.

Fig. 15: Mechanized maintenance of OHE

Dedicated Freight Information System (DFIS)

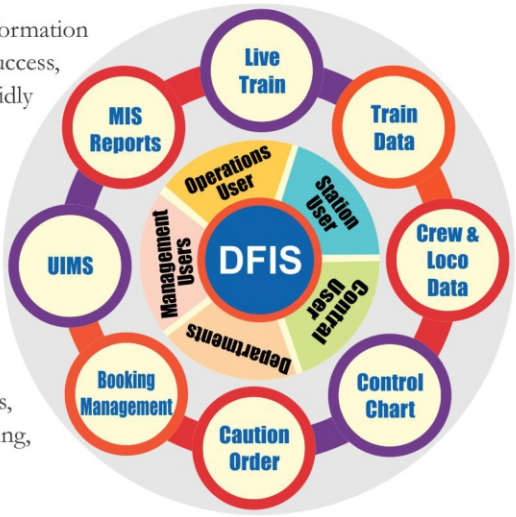
Nanduri Srinivas
Director OP & BD

Introduction

Dedicated Freight Information System (DFIS) is an in-house developed information system of OP&BD in DFCCIL. This system has achieved remarkable success, overseeing the management, operation of over 95,000 trains and is rapidly approaching to the milestone of 100,000 trains.

DFIS offers a wide range of benefits for stakeholders engaged in freight transportation by enhancing efficiency, visibility, planning, communication and decision-making. It can significantly contribute by improving overall logistic operations.

It is a comprehensive software solution designed specifically for managing and optimizing freight operations. It serves as a centralized platform that integrates various aspects of freight management, including E-Station Management, Loco/ Crew Management, Unusual Incident management system (UIMS), MIS Reports, Block Management System, Caution Order Management, Live train Monitoring, Control Charting, etc.



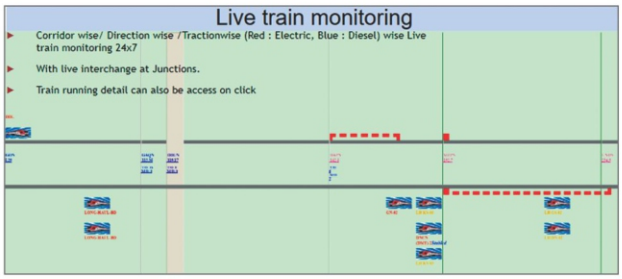
Need of DFIS

Unlike passenger trains, which operate on fixed schedules, freight trains do not adhere to a set timetable. As a result, freight operations require a significant amount of information management to ensure smooth functioning.

With the commencement of train services on the DFC without an existing information system, there was a need to create a mechanism to gather, store, and analyse data related to train operations, asset management, block management, crew management, and other critical operational aspects.

With the growing number of trains and the need for extensive data management, the DFIS was developed as a consolidated platform to integrate and analyse information from various systems under Indian Railway, like FOIS, CMS, ICMS, RBS etc.

Benefits:



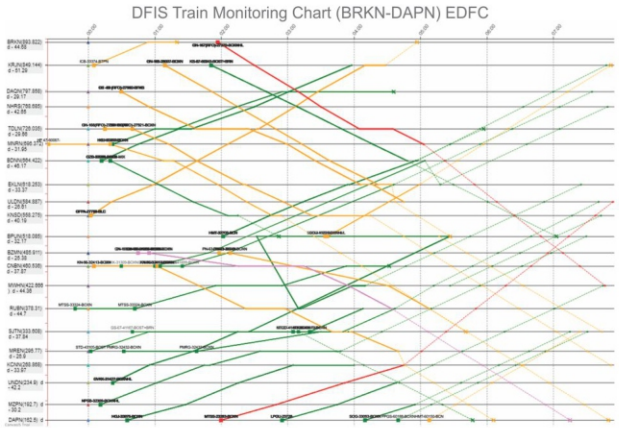
Improved Efficiency: With DFIS, manual and time-consuming tasks are automated leading to increased operational efficiency. The system can handle tasks such as generating train movement, shipping documents, managing invoices and tracking shipments in real-time, thereby reducing errors and delays.

Enhanced Visibility: DFIS provides real-time visibility into the status and location of shipments, enabling stakeholders to monitor the progress of each consignment. This visibility allows for proactive decision-making, prompt issue resolution, and better customer services. It also helps in identifing bottlenecks or inefficiencies in the supply chain enabling proactive interventions for smoother operations.

Optimized Routing and Planning: By analysing historical data and leveraging algorithms, DFIS can optimize routing and planning processes. It can consider factors such as distance, delivery timelines, traffic conditions, and carrier preferences to recommend the most efficient routes. This optimization can lead to cost savings, reduced transit times, and has even improved resource utilization.

Inventory Management: DFIS can integrate with inventory management systems by providing accurate and real-time inventory information. This also helps in optimizing inventory levels, reducing stockouts, and minimizing holding costs. Additionally, the system can generate alerts and notifications for low stock levels and ensuring even timely replenishment.

Streamlined Communication: Communication plays a crucial role in freight operations, involving multiple stakeholders such as shippers, carriers, drivers, and customers. DFIS facilitates streamlined communication by providing a centralized platform for exchanging information, updates, and instructions. This reduces communication gaps, minimizes miscommunication, and enhances collaboration among all parties involved.



Data Analytics and Reporting: DFIS collects and analyses vast amount of data related to freight operations. By leveraging data analytics, the system can generate valuable insights and reports, helping organizations identify trends, evaluate performance, and make data-driven decisions. These insights can lead to process improvements, cost reductions, and better strategic planning.

Planning & Development

The development of DFIS was guided by domain experts and technicians with extensive experience in the field. These individuals brought their practical knowledge and expertise to the project ensuring that the system was designed to meet the specific needs and requirements of the end user and industry.

DFIS is one of its kind projects where the field workers with technical aptitude were trained to develop and test information systems which not only caters specific user requirements but follow all required industry standards. The regular feedback received from multiple stakeholders, including field staff, station masters, controllers, and management users, has been instrumental in driving the system's evolution and ongoing improvements.

Data security and protection are of utmost importance for any information system. In the case of DFIS, stringent measures and protocols are continuously being enhanced to guarantee the confidentiality, integrity, and availability of data. Robust security measures, such as access controls, encryption, and regular backups, are implemented to safeguard sensitive information and prevent unauthorized access. The DFIS team remains committed to ensuring the highest level of security for the system and the data it manages.

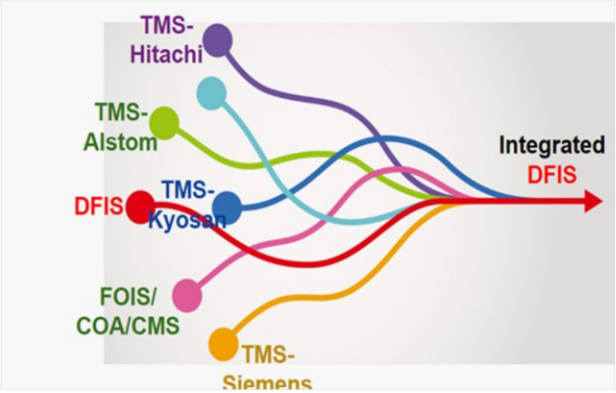
"Technology is nothing. What's important is that you have a faith in people, that they're basically good and smart, and if you give them tools, they'll do wonderful things with them."

- Steve Jobs

DFIS Integration

DFCC utilizes railway assets, including wagons, locomotives, and crew for train operations. The integration with IR applications allows for seamless communication and data sharing. In addition to various existing IR systems, the DFIS is seamlessly integrated with the Train Management System (TMS) to minimize the need for human intervention in data collection. This integration also enables the DFIS to serve as a centralized platform for the TMS which may be implemented by different vendors in different sections.

Apart from integrating with external systems for operational needs, DFIS has the capability to integrate with other systems and technologies. For example, it can seamlessly connect with inventory management systems, allowing for accurate and up-to-date inventory information. This integration optimizes inventory levels, reduces stockouts, and minimizes holding costs. DFIS can also integrate with external platforms, such as transportation management systems, allowing for smooth data exchange and collaboration with partners and service providers.



> **"Innovation is taking two things that already exist and putting them together in a new way."**
>
> **- Tom Freston**

In-House technology innovation

DFIS stands out as an in-house technological innovation that aligns with the Government's *Atmanirbhar Bharat* (Self-Reliant India) initiative. It has been acknowledged and honoured with a team award for its in-house technology innovation by the Minister of Railways in 2022.

Latest initiative (Door to Door Delivery Services)

To cater to customer-centric services and attract non-traditional customers and commodities, such as FMCG and online delivery services with competitive pricing strategies, the DFIS is soon launching a new project called D2D (Door-to-Door) delivery services. D2D aims to provide a comprehensive, end-to-end digital solution for all logistics needs, acting as a convenient "one-stop shop" for customers.

This initiative aligns not only with the government's efforts to promote ecological sustainability by encouraging individuals to choose railways as their preferred mode of transport due to its convenience, timeliness, and environmental friendliness, but also supports small businesses and entrepreneurs. DFIS intends to involve them as agent managers, hub managers, and aggregators, thereby providing opportunities for them to join and contribute to the logistics ecosystem.

D2D will be a convenient logistics solution that encompasses the entire process of delivering goods directly from the sender's location to the recipient's doorstep. It eliminates the need for multiple intermediaries and provides a seamless end-to-end experience for customers.

D2D services will offer several benefits, including convenience, time savings, and increased efficiency. Customers can have their goods collected from their desired location and delivered directly to the intended recipient without the need for additional handling or transportation.

Overall, D2D delivery services provide a convenient and efficient solution for both businesses and customers, ensuring timely and hassle-free delivery of goods while reducing environmental impact.

Way forward

Soon DFIS will leverage data analytics, Artificial Intelligence and reporting capabilities of business Intelligence tools to provide valuable insights for strategic decision-making. By analysing historical data and trends, the system will generate reports on performance, efficiency, and cost metrics. These insights will enable organizations to identify areas for improvement, optimize operations, and make data-driven decisions.

Data Analytics and Reporting: DFIS collects and analyses vast amounts of data related to freight operations. By leveraging data analytics, the system can generate valuable insights and reports, helping organizations to identify trends, evaluate performance, and make data-driven decisions. These insights can lead to process improvements, cost reductions, and better strategic planning.

> **"The greatest danger in times of turbulence is not the turbulence; it is to act with yesterday's logic."**
> **- Peter Drucker**

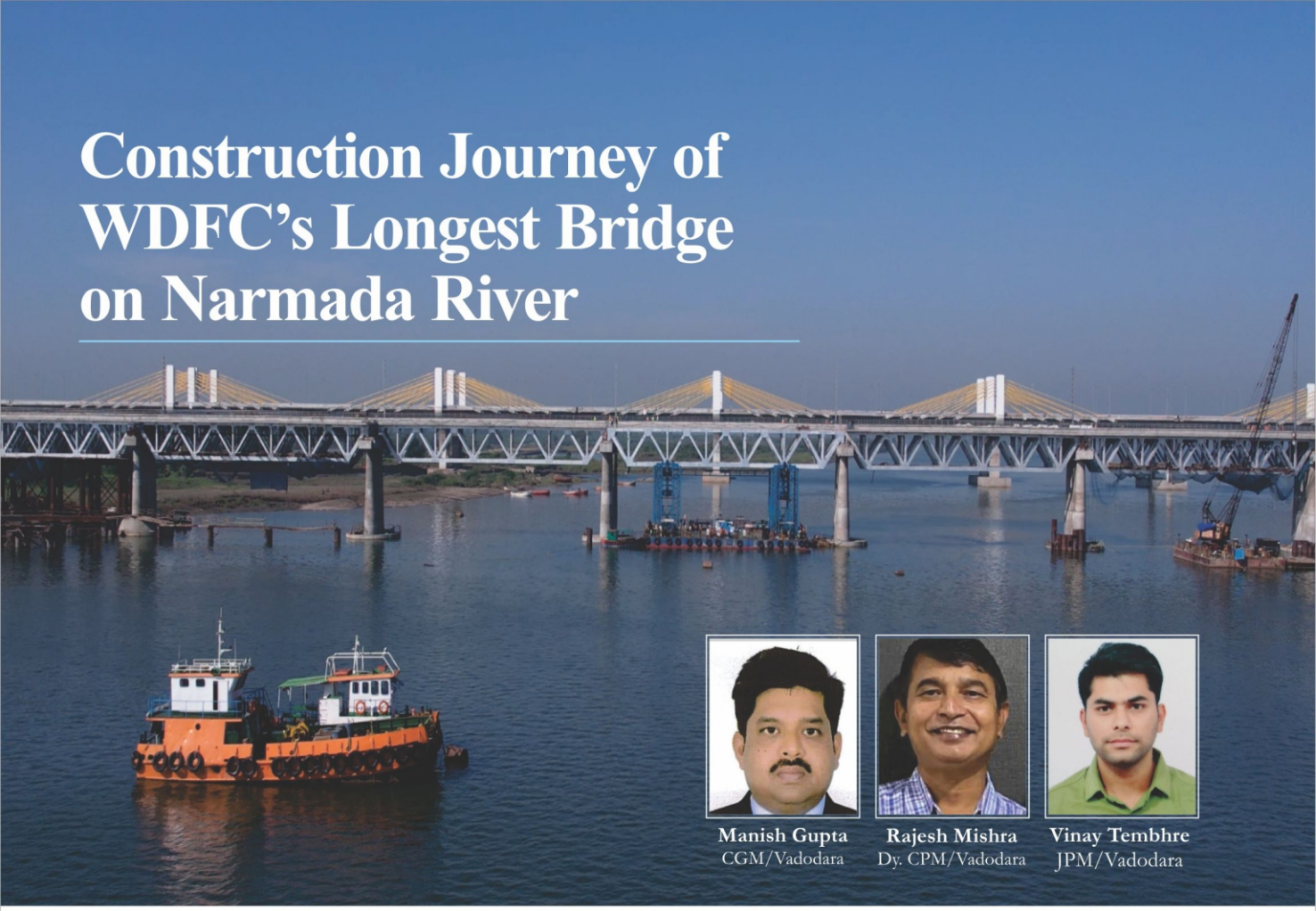
Conclusion

In conclusion, the Dedicated Freight Information System (DFIS) is a technological innovation that will revolutionize freight operations in Railway domain. Its ability to automate tasks, optimize processes, enhance visibility, and provide valuable insights will greatly improve operational efficiency, productivity, and customer satisfaction. As the DFCCIL continues to evolve, DFIS will play a vital role in shaping the future of freight transportation by integrating advanced technologies and delivering continuous innovations.

> **"Innovation is the lifeblood of logistics. Embrace it, nurture it, and watch your business soar."**

Double stack train on DFC accompanied by IR train in backdrop of Container terminal

Construction Journey of WDFC's Longest Bridge on Narmada River



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JPM/Vadodara

The Western Dedicated Freight Corridor (WDFC), traverses over "The Narmada River" in Bharuch district of Gujarat state, through 29x48.15m span Steel Girder Bridge with concrete deck slab. This is the longest river bridge of WDFC, Engineered & Constructed, 98 km downstream of "Sardar Sarovar Dam" & 37 Km on the upstream from the sea mouth of the river.

The bridge water ways, HFL and river training works have been designed for the design discharge of 72,452 Cumec at an HFL 13.6 with 100 years return period, considering topography, hydraulic parameters and Model study conducted by IRI, Roorkee. The Bridge structure is designed for DFCC loading (32.5MT axle load) with durability /serviceability period of 100 years under provisions IRS Bridge Rule of IRS codes such as, Concrete Bridge code, Welding Bridge Code, Steel Bridge code and relevant IRC/ International codes/standards etc.

The Narmada Bridge (Br no 57) is constructed by the IIS- L&T Consortium as Design & Build Contract. This Engineering Marvel has been constructed using approx 96470.Cum concrete, 7080MT Reinforcement steel, 7570MT, Structural steel etc. Construction was facilitated by activities heavy machineries such as Gantries (70MT to 100MT capacity), Vibro hammers, Cranes (45MT to 75MT capacity), Barges (300MT capacity), Tug boats(450HP)- for Mooring, 02Passenger Boats, Launching Cranes (260MT to 300MT capacity) and Barge mounted Lifting towers with saddle frame (160 MT capacity) etc.

Narmada Bridge (29x48.15m) Under Slung Steel Girder with RCC Deck Slab
Fig 1: Bird's eye view of Narmada Bridge No 57

Salient Features:

1	**Bridge No. 57**	**Span :** 29x48.15m with **Total Length:** 1396m
	Geographical Location	Bharuch district, Gujarat. Approx. 98 Kms on Downstream of **"The Sardar Sarovar Dam "** & 37 Km on the upstream from the Gulf of Cambay.

2	**Hydraulic Parameters**	Model study conducted by IRI Roorkee. **Discharge:** 72,000 Cumec at **HFL :**13.6m **Max. Discharge intensity:** 99.79 cumec/m **Vmax (Bridge Span):** 5.22m/s, **Vmax (Guide bund):** 3.27m/s **Scour Depth from HFL:** at Piers 40.391m (min) & 44.423m (max)
3	**Structural Details**	
3.1	**Foundations and Substructures:**	**30 nos.**
3.1.1	**Abutments -2 Nos**	Wall type (6.5m to 4.6m height and 13.86m length) resting on Well foundations having 13.8 & 14m dia, Depth: 41.2-53.5m, Steining thickness: 1.1m to 1.5m
3.1.2	**Piers -28 Nos**	Wall type (10.96m to 12.96m height and 7.5m length) resting on Well foundations having 11 m dia, Depth: 45-59.95m, Steining thickness: 1-2m
3.2	**Super Structure: 58nos**	
3.2.1	**Steel Girder (welded +HSFG bolt) with RCC Deck slab**	**Type:** Under slung, **Total:** 58 Girders (2 in each span), **Span (c/c):** 48.15m, Girder **Length:** 48.05, **Weight:** 130.5 MT (each) & 7569 MT (Cumulative)
3.2.2	**Bearings**	Spherical
3.3	**Protection work**	The Flood Protection Embankment (FPE) and guide bunds
4	**Designed life**	100 Years
5	**Package no and Contractor**	CTP-15B and IIS- L&T Consortium
6	**Type of Contract**	Design & Build Lump Sum Contract (Fidic Yellow- Book-1999),
7	**Cost of work**	Approx 440Cr
8	**Materials Consumed**	96470.Cum concrete, 7080MT Reinforcement steel, 7570MTStructural steel etc.
9	**Heavy Machinery used**	04 Gantries (70MT to 100MT), 03 Vibro hammers, 13 Cranes (45MT to 75MT), 11 Barges (300MT capacity), 02 Tug boats (450HP), 02 Passenger Boats- Launching Cranes 02 nos (260MT-300MT), Barge with launching assembly (capacity 160MT), etc
10	**Completion duration**	15-10-2015 to 09-11-2022 (Main bridge and approaches) 7 Years 25 days

2. Construction Journey of Narmada Bridge:

2.1. Preparatory works & Construction Modality:

a. The Bridge construction commenced on 15 October, 2015. Initially the Survey work w.r.t Bench Mark of SOI, validation of data, Stacking of ROW and establishment of site office, labour camps, Working Yard equipped with machineries etc. got completed. In the Bridge alignment, a small island was trapped between the main and subsidiary channel (between P6-P7) of river stream, to make approach to sub structures beyond P6 a temporary bridge 2x 6m span was constructed with steel liners, girders and Precast RCC slabs. The said island (part with in ROW) was developed in working platform for execution purpose.

b. As per site topography, the bridge spans divided into two categories **(i)** Land Spans (on south bank A1 to P12 & on North Bank A2 to P26 later it extended to P25) **(ii)** Water Spans (P12 to P25).

c. Construction of Coffer Dam: The coffer dams approx. 16mΦ were made either of sheet piles or MS liners 1m Φx 21m/24mx 6mm with Guide liners & guide beams. MS liners with male-female attachments were driven with vibro hammer to average anchor length of 12m/14m below bed level. Total 13 cofferdams using 4120MT structural Steel were made. Sand was filled to create working Platform at RL 5m to 5.5m.

Fig.2(a) Liner Driving Vibro Hammer

Fig.2(b) Cofferdam liner piles completed

Picturesque Narmada Bridge in night (road bridge in background)

2.2. Construction of Bridge Foundation:

a) **Well Founding, Sump Creation & Bottom Plug:** In final sinking operation the well-founded to the founding level. If tilt shift found in permissible limit the sump in parabolic shape is created by grabbing and Bottom Plug concreting of M30 grade which is completed by Trireme concrete. Cumulative Bottom Plug Concrete is 10925Cum.

Fig.3(a) Cutting edge –Water well

Fig.3 (b) Well Curb ell Curb Reinforcement

b) Placing M40 Grade Precast Sacrificial Beam, Sand Filling , Intermediate Plug, Water Filling, Sacrificial Slab fixing & Top Plug:

Fig.4(a) Cutting edge –Water well

4 (b) Well Curb ell Curb Reinforcement

c) Well Cap: Well cap -RCC M40, 11m Dia and 2m ht Casted on the Top Plug. Well cap Cumulative Concrete 6210Cum and 785 MT Steel Reinforcement.

Fig.5(a) P2- Well Cap Reinforcement

Fig.5(b) Well Cap Casting

2.2.1. Sub-Structure:

28 Piers- each Casted in 02 lift each approx 5m-6m and thereafter caped with Pier Cap and subsequently Pedestals on the cap. For the Pier caps and pedestals, Doka shutters have been used. The Pier caps were over hanged 4.21m & 3.04m on either side of Pier. The shutter of Pier caps supported on velars fixed on steel Brackets which are attached with massive beams (fixed on both sides of pier top) using post tensioned Macauley Bar of 8 nos 50mm dia, (passing though the pier width). After Removal of Beams the recess/ Pockets were filled up by non-shrinkable cement grout. Photographs for Pier and Pier cap construction are as under. In 28 Piers 5822Cum M40 Concrete and 695MT Steel Reinforcement and In Pier caps 1783Cum Concrete and 270MT Steel Reinforcement were used.

02 Abutments & Return walls: RCC M40 grade casted in lifts. Total 82Cum Concrete and 81MT Steel reinforcement were used.

Fig.6(a) Pier P10-P11 with Pier cap

Fig.6(b) Abutment A1

2.2.2. Super Structure:

a) Under Slung Type Steel Girder:

IRS Steel Bridge Code & IRS Welded bridge Code for the DFCCIL loading as per IR Bridge Rule. Mild Steel B0-E350 grade material (except bracings) considered for design of Steel Girders. Bracings B0-E250 grade steel. Bottom Chord, Top Chord, Vertical, Diagonal, End racker, Stub- Column (FW10mm) etc were designed welded members with fillet weld of 8mm. Batten plates and other minor components welded with 6mm fillet weld. Slip resistance joints with 8.8 grade HSFG bolts of dia 22mm to 30mm considering the slip factor of 0.4. RCC Deck slab designed for M35 Grade concrete and severe environmental conditions. The design has been Proof Checked by the IIT Roorkee.

b) Fabrication of Girder:

Indian Railway Standard Specification for Fabrication and Erection of Steel Girder Bridges B1-2001 (ACS 10 up to 2016), & IRS Welding Bridge Code, BS-111 - Guidelines for use of High Strength Friction Grip (HSFG) Bolts on bridges on Indian Railways, IRS-M39 -2001, IRS M-28-2012, IS 7307 & 7310, IS 4000 etc and other relevant codes were used. RDSO approved vender ESSAR (Later rename AM&NS), Hazira, Surat. QAP, WPSS, WPQR and WQT approved by the RDSO as inspecting authority. Out of 58 nos 36 girders have been inspected and certified by the RDSO and 22 Girders have been inspected and certified by the CEIL -Ahmedabad. Major components welded with Submerged Arc Welding (SAW) and wherever not feasible Shielded Metal Arc Welding (SMAW) $ MIG – CO2 welding used. The faying surfaces initially (08 girders) treated by Aluminium Metalizing having Minimum DFT 110 μ (as per BS-111) and later remaining girders faying surfaces treated with in organic Zinc Silicate primer with DFT of 60-80 μ.

c) Launching of Girder: - For land Spans ((A1 to P12) & (A2 to P25)), Launching scheme was decided on basis of dimension & weight of Girder, Space (for assembly + Crane movements) available at site, approach roads etc. accordingly for land span of 02 Methods of Launching were used:

i. A1 to P10: 10 Spans (20 Girders): Launched by Tandem lifting by two cranes (300 MT and 260 Mt) and placing the girder at position. First Girder was launched on span P9-P10(Up) on 14 June, 2020.

Fig.7 Launching of Under Slung Girder of 48.15m Span (130MT Wt) by tandem Lifting with two cranes (300MT & 260MT)

ii. **P10 to P12 & A2 to P25:** 6 Spans (12 Girders): Due to space constraints for movement of launching cranes were not possible after assembly of Girders on Ground, there for the girders assembled on elevated platform supported on trestle or liners and after complete assembly and final painting the girder is lowered and placed at its position.

Fig.8: P28-P27 Assembly of Girder on Trestles

iii. **For water spans:** P12 to P25 :13Spans (26 Girder): Special launching arrangement mounted on massive barge was used for launching of girders. Gross weight of Total assembly in loaded condition is 650MT.

Sequence of Activities Observed in Launching of the Girder for Water Span:

Out of 26 Girders, 21 Girders got assembled in Assembly yard below Gantries. Balance 05 Girders were assembled on assembling Bed P5 to P1 and transported to jetty for loading in barge. The following sequence was observed for launching of girders.

- With help of Tug Boats of 450HP capacity, during low tide the Barge is parked in between finger jetty and secured using mooring winch to receive the assembled USG.
- The assembled Girder lifted and shifted over barge with self-propelled 100MT & 70MT Gantries and loaded on the saddle frame. The Girder anchored with saddle frame using the MACALLOY bar.
- The Barge loaded with girder was towed by 02 Tug Boats.
- With available water level in range of 2.2m to 2.5m, the Barge loaded with Girder were placed parallel Pier Cap to the Launching span keeping horizontal clearance of 2 to 3m from nearest face of the respective Piers.
- Saddle truss (equipped with Girder on its top) was lifted by synchronized operation of 4-lifting winches each of 10MT capacity. Total 160MT force was applied through winch pully arrangement. Then saddle truss got lifted till the vertical clearance between Girder's stub column bottom and top of pedestal reaches to approx. 1.4m to 1.5m.
- The Brage with lifted girder is aligned precisely with help of 04 mooring winches and got passenger boats so that the girder aligns with the centerlines in longitudinal direction. Then the saddle frame (with glider is lowered) till the stub column center align with bearing centers.
- After placing the girder in position, the girder was unlocked from saddle frame by removing anchor bolt and then saddle frame got lowered. As the water level lowers and clearance of 300mm to 350mm created between bottom of Girder and top of lifting tower assembly, the barge was towed away with tugboats of 450 Hp capacity.
- After final alignment, fixing of Bearing & Grouting Girder got fixed in its final position. Spherical Bearings were also used for the work.

Fig 9(a): Loading of Assembled Girder on Launching Barge

Fig.9(b) Towing of Loaded Barge with Tog Boats of 450HP

Fig.9(c) First Girder for Water Span launched on 03.03.2022

Fig.9(d) last Girder (P13-P14Up) launched on 17.10.2022

2.2.3. **Biggest challenge in Narmada bridge construction was faced when** P24 well collapsed and most of its parts were buried under sedimentation. Its retrieval under water in the tidal condition was one of the most challenging jobs. First the Collapsed coffer dam parts were retrieved and there after the Well Concrete has been cut by wire saw cutters. The Cylindrical Cell of collapsed well sliced into three parts. The first part which is from top 6m to 7m length segments & there after second side parts of 12m to 13m. Each segment was approx. 0.9m to 1.5m width and 1.25m thick. The weight of sliced segments was initially kept in 17Mt-20Mt and there after it got increased gradually up to 60MT. For shifting the heavier segments, the buoyancy effect of water was used for this shifting of sliced piece.

3. **Quality control, Safety, Environment and Health provisions**, have been observed at Site. During COVID-19 period, the SOP was being prepared based on Guide Lines issue by GOI & Local authorities and same has been adhered too. As a result, the work was successfully executed during COVID period with minimum infection of 05 nos.

4. The Bridge work up to Super structure for UP & DN both line, approach embankments along with approach slab got completed and track where also laid over this bridge.

5. This important Engineering structure lies between the NHSRC & Express way Bridges on its either side. Considering its Strategic Placement having visibility to clients and prospective users, it has been conceptualised to highlight this longest milestone bridge of the WDFC.

Arial view of Narmada Bridge in Sachin-Vaitarna of WDFC

Aerial View of 2x25 kV Ateli Traction Sub-Station in WDFC

Technological Upgradation & Innovations in DFC

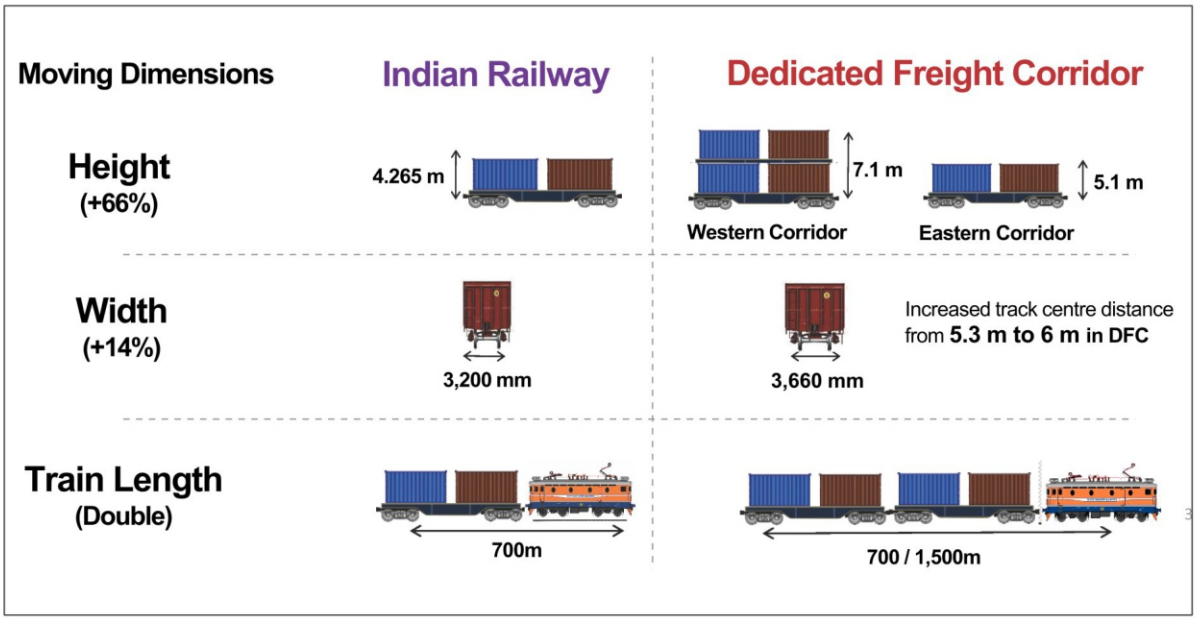
Love Shukla
JGM/Corporate Cord.

Innovation and use of cutting-edge technology are the keystones of the Dedicated Freight Corridor project which ushers a new era of efficiency, safety, and sustainability. This revolutionary project is unique and has the potential to propel Indian Railways into the Railways of future. The story of innovation in DFC is started right from its planning stage where DFCs are designed to be advanced in all parameters.Another example of use of technology is the heavy use of New track Construction machines and mechanised installation of OHE assets. In addition, advanced signalling and control systems, TCAS and OCC enable precise, real-time monitoring and regulation of train movements, enhancing safety and capacity. DFC project is a testament to the synergy of state-of-the-art technologies and a commitment to a more sustainable future. These advancements promise faster, safer, and greener rail transportation, marking a significant leap forward in the evolution of this vital mode of transit.In next few pages you will find a glimpse of few of the innovations and technologies deployed over Dedicated Freight Corridors.

High-Capacity Track structure

- DFC track structure have been designed for heavy axle load of 25 T at maximum speed as 100Kmph
- Bridges & formation designed for 32.5T which can be upgraded in future without affecting its formation and structures.

Larger Maximum Moving Dimensions (MMDs)



- Enabled DFCCIL to run bigger rolling stocks and special type of rolling stocks
- Increased throughput per train run for Railways

New Track construction machine (NTC)

- Superior quality track structure achieved
- Better control over track parameters
- State of the art track construction
- Capable of laying 1.5 km track per day

High rise OHE (2x25 kv)

- 2x25 KV OHE system
- 7.1 m high OHE
- Capable of carrying double stack container trains
- Boost to EXIM traffic

OHE wiring using Automatic Wiring Train

- Auto tensioning and simultaneous wiring of Contact and Catenary Wires
- Wiring Possible in Both directions
- Average OHE installation of upto 6 km per day

Mobile Rail Based Auger

- Used for the first time in India for cylindrical foundation
- Can work on Soil/Ballast/Rail
- Can dig the circular foundation faster with min. manpower
- Self propelled vehicle Rail/Road/Ballast

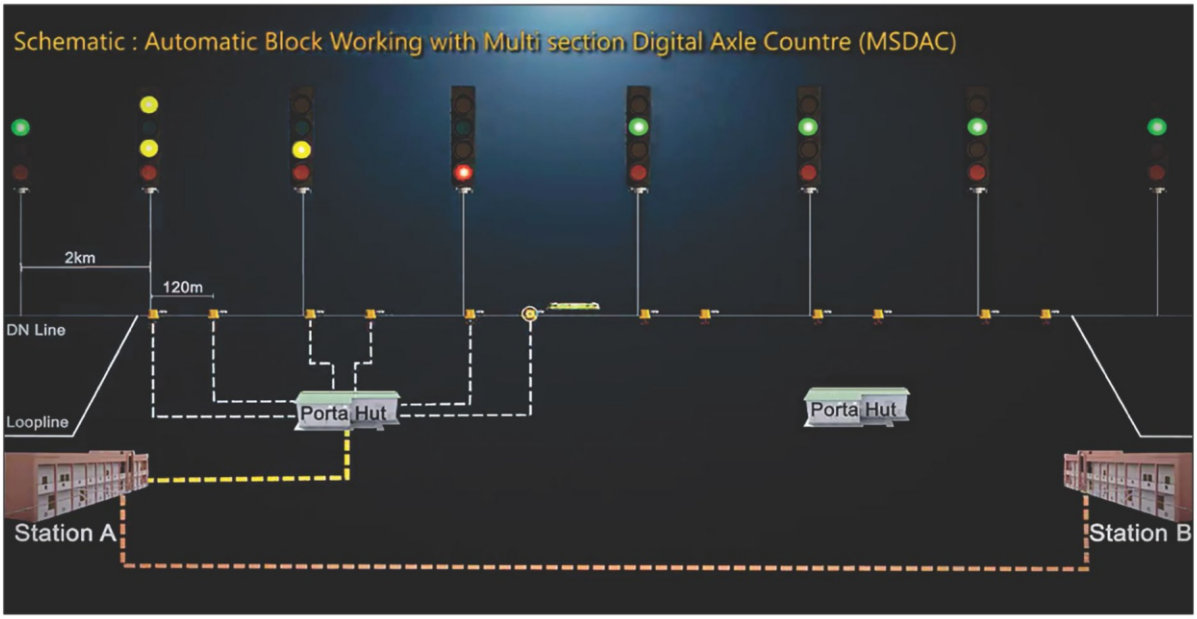
Mechanical Mast Grabber for OHE erection

- Rail cum road vehicle
- Hydraulic crane
- Grabber for lifting of Mast
- It can work faster with less manpower

Electronic Interlocking (EI) along with MSDAC (Multi Section Digital Axle Counter)

- Safe train operations in stations & Auto block sections
- Train detections in stations & block section using MSDAC
- Automatic block signalling for block sections

Automatic Signaling and GSM-R based Communication

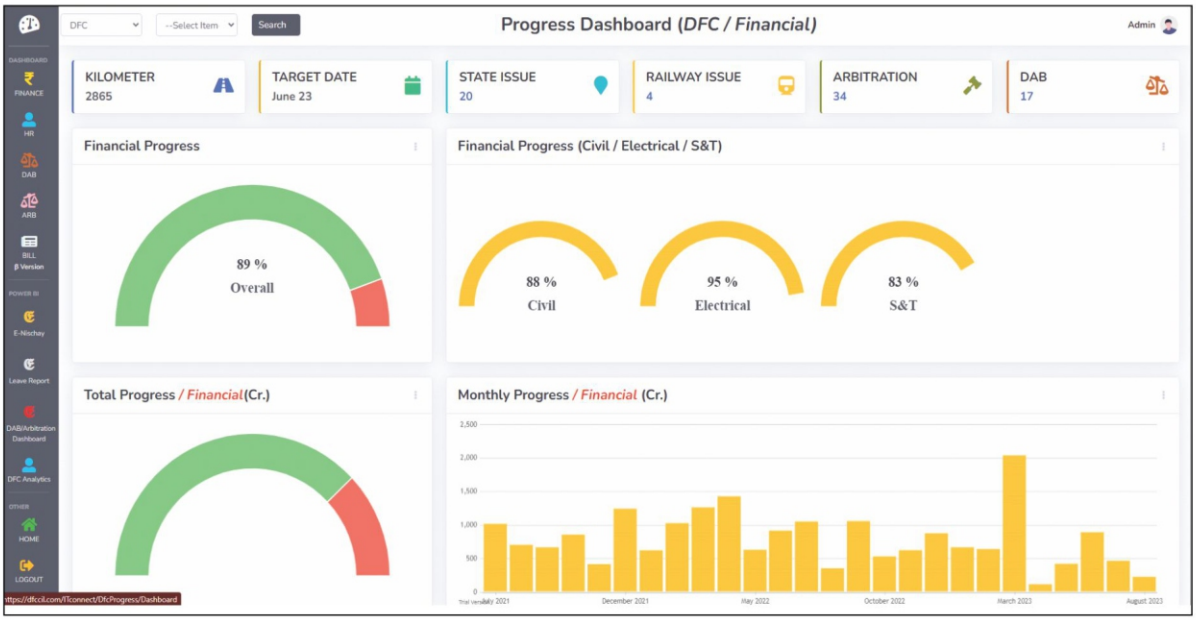


- Automatic signaling with two km spacing
- Section length - 40 km

Ulhas Bridge (Thane) in Vaitrana-JNPT section of WDFC

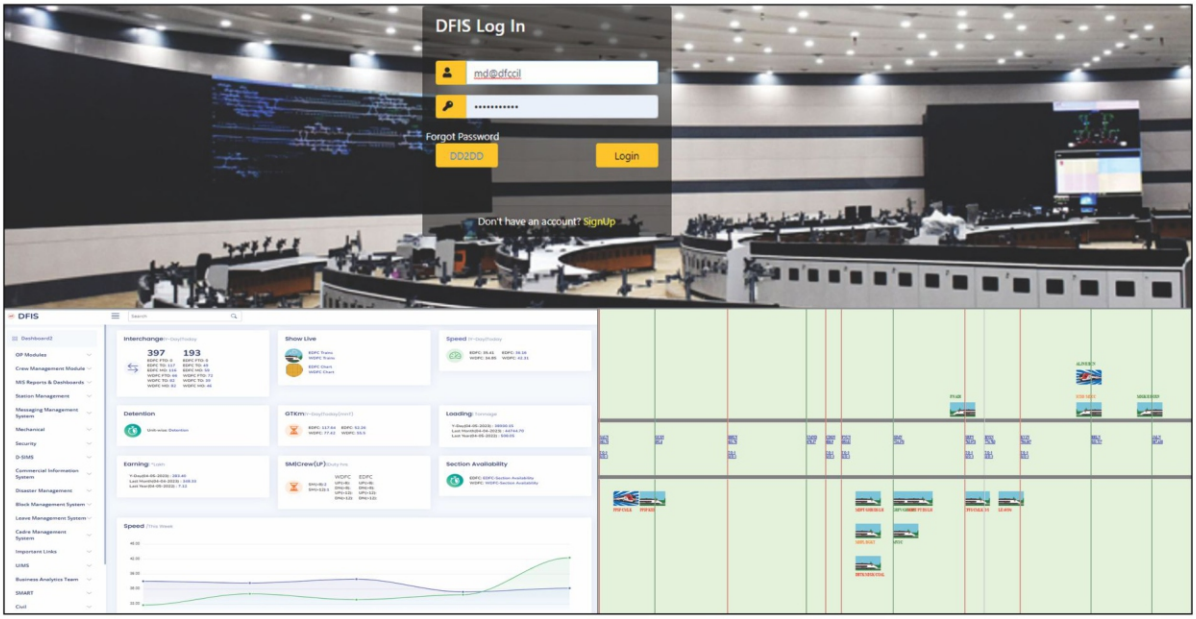
- Span arrangement : 6x79.980 M
- Total Cost : Rs. 80 Cr.
- Structure : Steel open web girder
- Sub structure : RCC solid

In-house Project Monitoring Dashboard



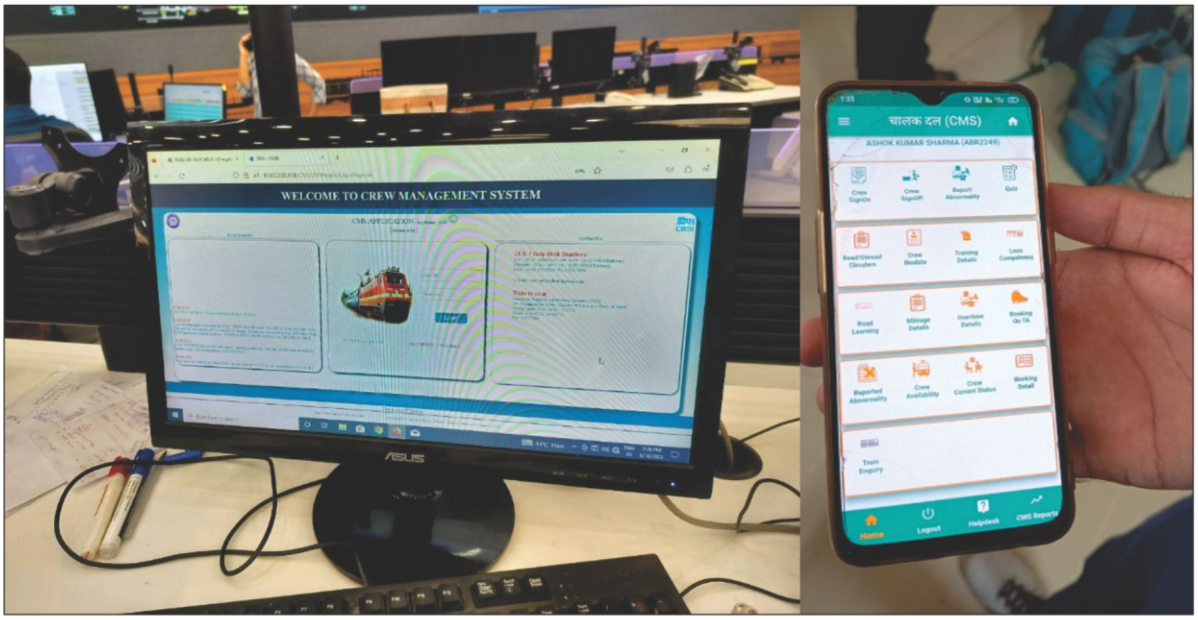
- Developed in-house by DFCCIL team
- Covers every aspect of project
- Real time integration of financial and physical progress
- Real time monitoring of issues related to Zonal Railways & State Govt.

Dedicated Freight Information System (DFIS)



- Developed in-house for monitoring train operations.
- Shows real-time details of trains run on DFC network.
- Helps in planning of train movement, maintenance blocks, etc.
- Compatible with IR systems and Control Systems of DFC.

Virtual Crew Management System

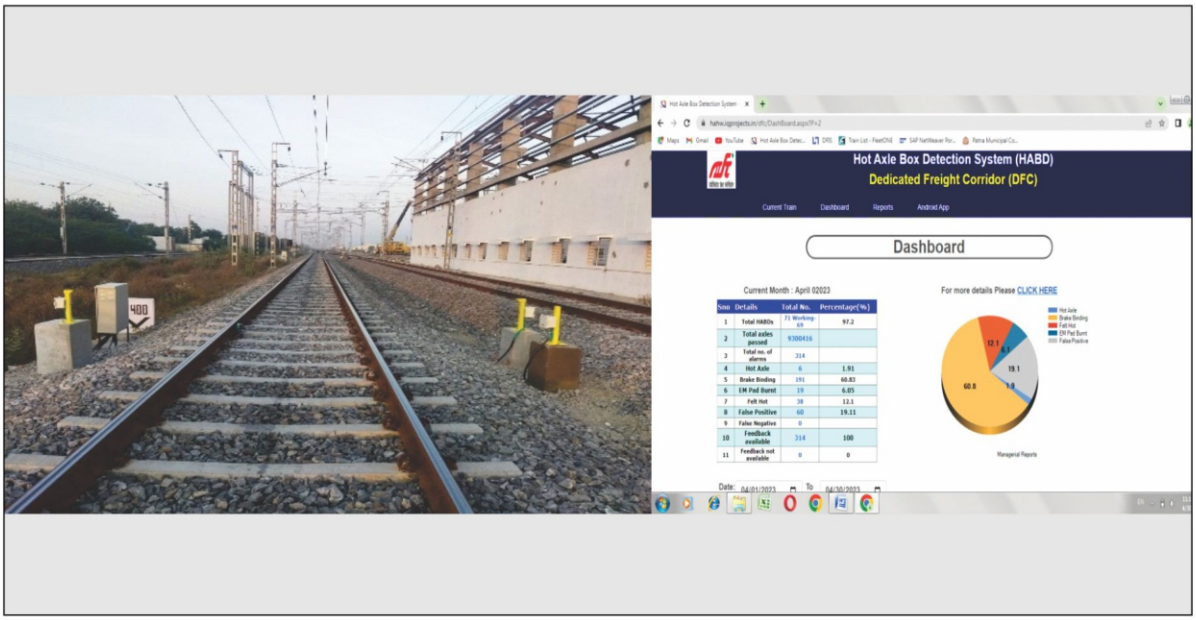


- TA is generated on Crew Management System by OCC. As crew is assigned, a notification goes to Crew on Chalak Dal app.
- Sign on is done in SM room (Geo-fenced) on Chalak Dal App and approved by OCC on CMS
- The Breath analyzer value & Ticket number is fed on Chalak Dal which further passes to CMS
- DFCCIL got virtual lobby for REJN, AELN, FLN, PNUN & CNBN which are being operated from OCC/ADI and PRYJ

Machine Vision Inspection System (MVIS) at New Daud Khan station

- Developed indigenously in joint venture of DFC & IISc
- Would detect rolling stock defects at higher speed
- Would replace rolling and examination in near future
- Low cost solutions

Hot Axle box Detector (HABD)



- Detects hot axle boxes of rolling stock by monitoring the temperature of the bearings
- Installed at a distance of 10-12 Kms before approaching station
- DFCCIL has reset the alert at 75 °C absolute and 30 °C as temperature difference between two axle boxes

Rail Flyover (RFO)

- Length of Bridge : 134.10M.
- Spam : 1x76.2 +1x45.7 +1x12.2
- Cost : Rs. 51 Cr.
- Structure : Open web girder

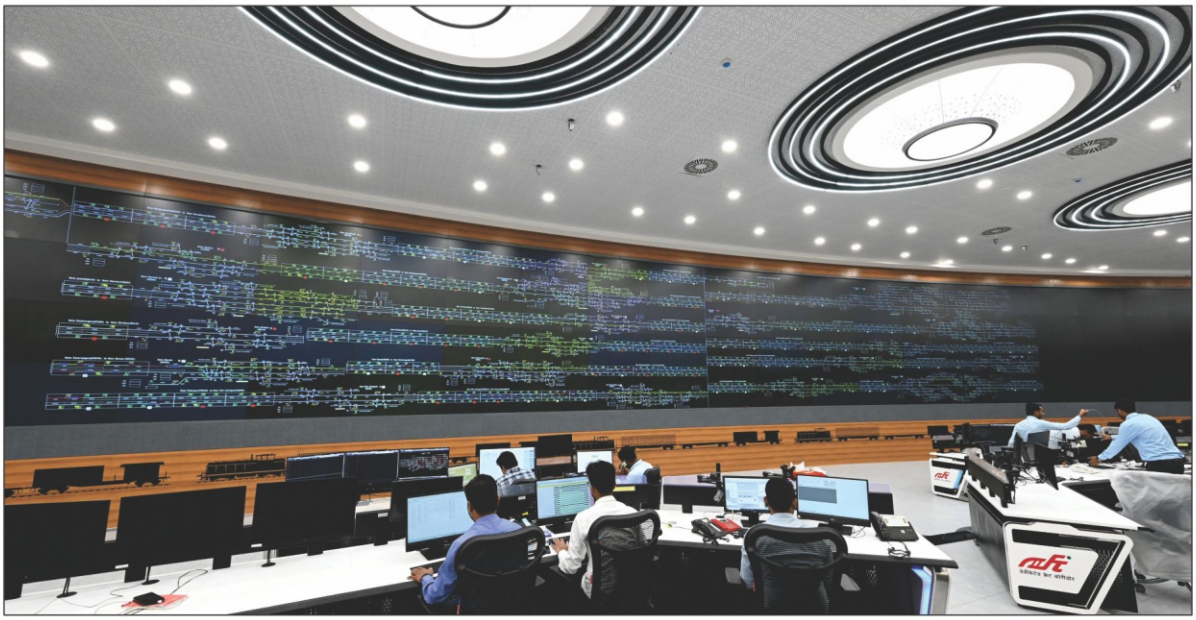
Viaduct for Freight Trains

- 2.7 km long viaduct in Rewari Dadri section of WDFC
- Box Girder concreting: Single pour
- Span Arrangement : 75x30.5 M Concreting box girder +10x30.5 M PSC-I girder + 2x18.7 M PSC-I girder

Tunnel across the Aravalli Range

- Constructed through drill & blast with heading & benching
- First of its kind for carrying double stack container
- Rock type: quartzite (class-II to class-IV)
- Cross sectional area : 136.5 sqm

Operation Control Centre

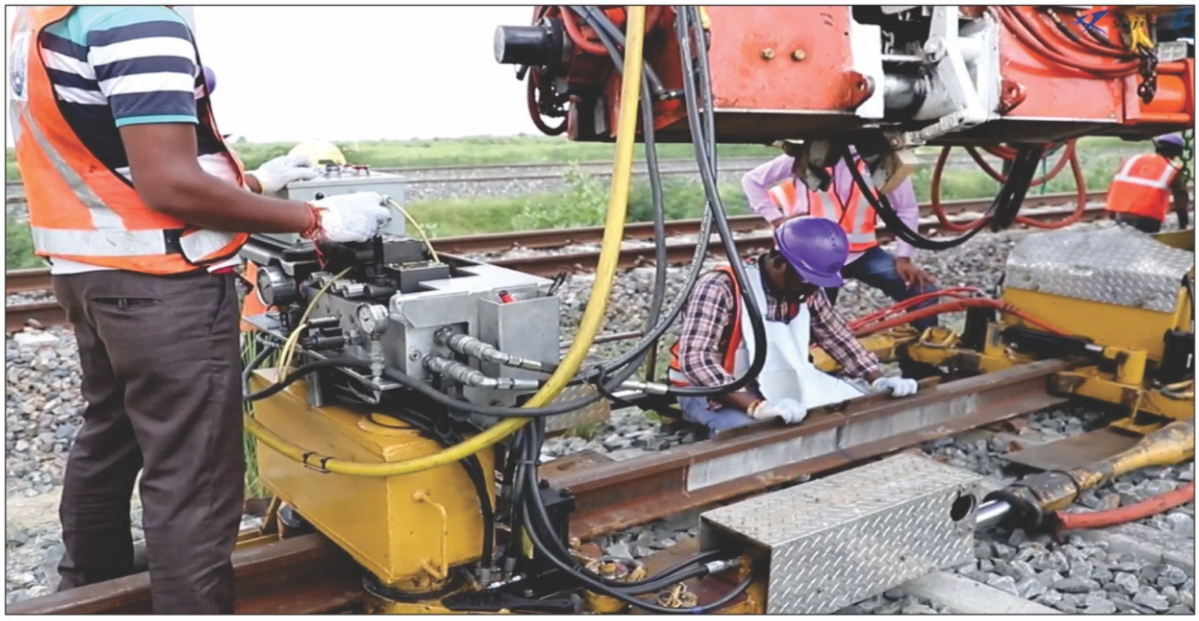


- Live centralised monitoring of all train operations.
- Centralised control & operations of SCADA system.
- Centralised health monitoring of all the S&T equipment.
- Control & Command Centre in Disaster Management.

Extensive Use of Geogrid and Geotextiles

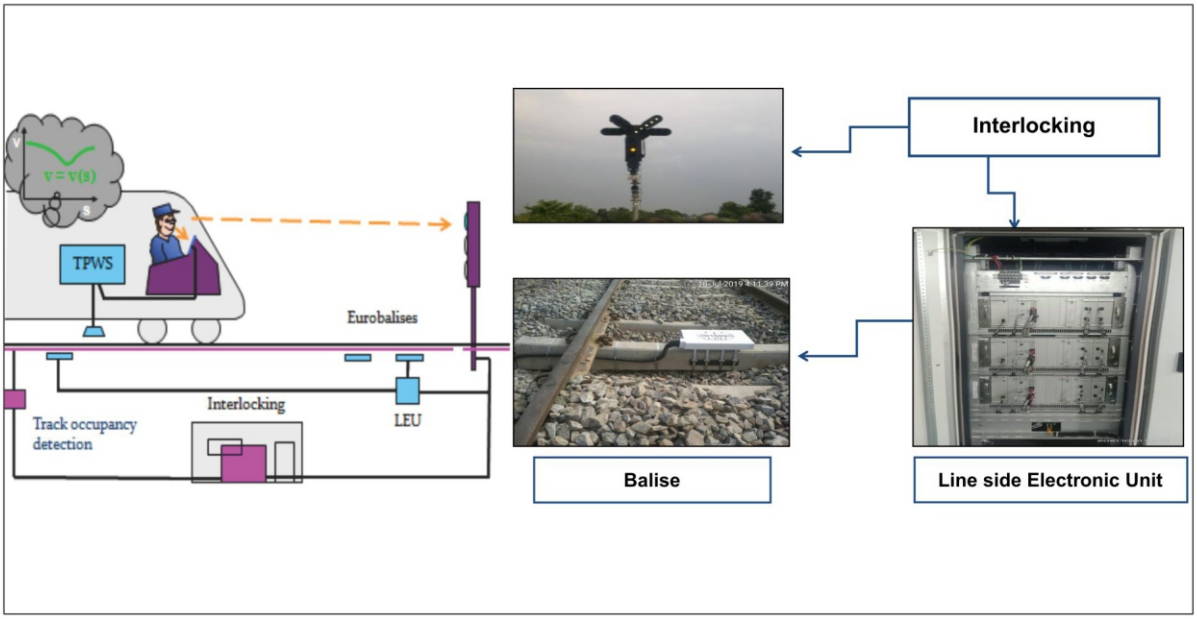
- Geo Textile slope protection 'TechRivetment' at Karnawati River in PRYJ-DDU section of EDFC
- Mattress type arrangement with interconnected hollow pockets made of Geo-textile

Continuous Welded Rails & Super Puller for Rail Welding



- Continuous Welded Rails have lesser maintenance requirements
- Destresses the rails
- Super puller pulls rails upto 1 km can help in achieving desired gap in flash welding of rails

Train Protection and Warning System (TPWS)



- Automatic Train Protection (ATP) system is to enhance safety in Train Operations
- To control speed of train by automatic actuation of brakes in case loco pilot fails

Decarbonizing Transport with Carbon Offsets

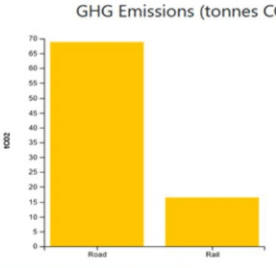
Nav Goel
DGM/Finance

Under its Nationally Determined Contributions (NDCs), India now stands committed to reducing the Emissions Intensity of its GDP by 45 per cent by 2030, from the 2005 level and achieving net zero by 2070. The Energy Conservation (Amendment) Act' 2022 aims to manoeuvre India on the right track. The Act gave a green signal to Central Government for the creation of a carbon credit trading scheme. Bloomberg NEF research report opines that the total value of carbon credits produced and sold could reach to $1 Trillion by 2037. Thus, participation in the carbon trading market is prudent both from an environmental and commercial angle.

India's per capita emissions currently stand at a mere 1.8 Tons of CO2e (versus the USA at 14.7 and China at 7.6). However, India is the world's third-largest emitter at 2.9 Giga Tons CO2 equivalent (around 4.9% of global emissions). Article 17 of the Kyoto Protocol allows countries that have emission units to spare - emissions permitted to them but not "used" - to sell this excess capacity to countries that are beyond their targets thus enabling emissions trading. The same got reaffirmed in Article 6 of the Paris Agreement. India leads the pack, accounting for 40-50% of annual carbon credits sales and having 1685 projects registered under UNFCCC's CDM (Clean Development Mechanism) as of March, 2022.

According to India's Third Biennial Update Report (2021) to UNFCCC, the transport sector is estimated to have contributed to 274 million tonnes of CO2 equivalent emissions per year in 2016, accounting for roughly 11% of the total emissions generated by the entire economy. Around 70% of freight movement and 90% of passenger movement can be attributed to the road sector alone, which is the most carbon-intensive mode among all available options. Rail freight typically produces lower emissions per tonne-km than road freight, mainly due to the more fuel-efficient locomotives and the lower rolling

Parameters	
Origin	Jawaharlal Nehru Port Trust, Juna Sheva Village, Navi Mumbai, Maharashtra, 400707
Distance by Road (Km)	1526
Distance by Rail (Km)	1441
Destination	Dadri, Uttar Pradesh
Commodity	Container
Weight (in tonnes)	1250



GHG Emissions	
	Tonne CO2 Equivalent (tCO2)
Road	68.81
Rail	16.41

The calculation is done **onfreightghgcalculator.com**, an initiative of the Logistics Division under DPIIT.

resistance of trains in comparison to trucks. Therefore, the potential for rail systems to earn Carbon Credits is immense owing to their low carbon emission intensity (approx. 23% of roadways).

The Delhi Metro has earned 4.4 million carbon credits which has been generated through innovative technologies of regenerative braking etc. and due to Modal Shift. Following the suit, in December, 2022, the Ministry of Housing and Urban Affairs advised metro rail corporations to register for carbon credits.

The Carbon Credit Ecosystem follows a set of guidelines and protocols for registering and issuing carbon credits, which are established by the standard issuer. Each standard maintains its own registry, and notable examples like CDM, Verra, and Gold Standard. To obtain credits, projects undergo a thorough assessment by a third-party auditor. After issuance, the project developer may either sell the credits to a buyer or utilize them for their own purposes.

As per IEA, Transport as a sector accounted for 37% of CO_2 from end use sectors globally in 2021 and it could reach as high as 50% by 2030. Yet the transport sector comprises only 0.34% of all registered CDM Projects. The main reason for this low share is the narrow applicability of the Approved Methodologies, complex and time-consuming procedures involved in the quantification of the emissions and the separation between effects caused by the project and the 'no project' scenario. The process of turning Carbon Credits from a concept to reality can be challenging, as it often involves upfront investment, lengthy gestation periods, and the possibility of not being approved. Additionally, it may require the creation and submission of new project-specific methodologies. Nevertheless, gradual efforts are being made in the projects where the sheer volume and the large scale of the project make it worthwhile for participation in carbon markets.

Recently NCRTC which is implementing Regional Rapid Transit System (RRTS) project across the NCR has also invited bids for assessing the potential of Carbon Credits. DFCs - from Ludhiana to Dankuni (EDFC) and Dadri to JNPT Mumbai (WDFC) - are expected to make freight movement with less carbon and energy intensive. With commissioning expected to be completed by March, 2024, DFC alone is estimated to lessen Carbon Emissions by 455 million tonnes in over a 30-years period.

Indian Railways' commitment towards achieving complete electrification by December 2023, reaching net-zero emissions by 2030, and boosting the railway's share in freight transport to 45% by 2030 - creates a distinctive prospect to utilise carbon markets and monetise sustainability. As per IETA Estimates, trading in carbon credits could reduce the cost of implementing countries' NDCs by more than half – by as much as $250 billion by 2030. Thus, in addition to financial gains, participation in Carbon Credits projects also showcases the inherent advantage that Railways and DFCs offer in decarbonising freight transport in India.

Double stack container train with the backdrop of Aravalli hills

Unlocking Global Investment Opportunities

Sarvesh Gupta
AGM/Finance

External Commercial Borrowings (ECBs) in simple terminology means loans taken by resident entities from foreign financial institutions. Generally, these borrowings are denominated in foreign currencies. ECBs serve as a valuable financing tool, especially for developing countries like India, seeking to attract international investment to spur economic growth by funding various infrastructure and other projects at competitive costs.

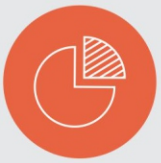
However, developing countries also face limitation in raising global funding due to the country specific exposure limit imposed by these funding institutions. As a result, some capital-intensive projects remain unexecuted, India being no exception.

Multilateral Investment Guarantee Agency (MIGA), a member of World Bank group was created in 1988, is one such international financial institution that provides political risk insurance (guarantees) for projects in a broad range of sectors in developing member countries.

As a specialized agency of the World Bank Group, MIGA charges certain fees/margin from the borrower in lieu of giving guarantees (political risk insurance and credit enhancement) to lenders participating in global financing of projects. Raising funds through ECBs backed with MIGA guarantees offers numerous advantages. MIGA helps cross-border investors and lenders manage non-commercial risks by insuring eligible projects against losses related to Breach of Contract, Currency Inconvertibility and Transfer Restriction, Expropriation, War and Civil Disturbance & Non-Honoring of Financial Obligations.

Breach of Contract

Currency Inconvertibility and Transfer Restriction



Expropriation

War and Civil Disturbance

Non-Honoring of Financial Obligations

The primary benefit of MIGA is that it enables countries, such as India, to access global financial markets more easily by offering more favourable competitive interest rates with longer tenures as compared to domestic borrowing options.

When an ECB is backed by a MIGA guarantee, it provides an additional layer of security for lenders. This guarantee instils confidence in lenders to invest in emerging financial markets by protecting them in case of borrower default. It mitigates perceived risks associated with investing or lending funds in emerging markets, making the borrowing more attractive to international lenders.

MIGA's comprehensive risk assessment and due diligence processes also aid in identifying, evaluating, and managing potential risks. It also provides assurance to all parties involved in ECBs backed by MIGA guarantees.

Another major advantage of raising funds through ECB backed by MIGA guarantees is the transfer of Know-How and Technology. Projects funded by such ECBs often involve collaborations with international investors who bring not only capital but also valuable expertise, technical know-how, and best practices. This knowledge transfer enhances local capacities and in turn promotes the development of domestic industries.

Furthermore, raising funds through ECBs backed by MIGA guarantees provides diversification of funding sources. Solely relying on domestic financing sources can pose risks, particularly when local financial markets are limited. Diversifying funding sources reduces dependence on domestic lenders and mitigates financial vulnerabilities.

Nevertheless, while deciding to raise funds through Global Market, potential pitfalls associated with ECBs should be carefully considered, such as exchange rate risk, regulatory challenges & compliances, vulnerability to capital flight, etc.

Therefore, striking a balance between leveraging the advantages of ECBs and implementing prudent policies is necessary to ensure debt sustainability and safeguard organisation as well as national interests.

To summarise, External Commercial Borrowings backed by guarantees from MIGA guarantees offer a compelling value proposition for countries seeking to attract foreign investment and promote sustainable development. The MIGA guarantee enhances investor confidence, reduces borrowing costs, and facilitates long-term capital infusion. It serves as a catalyst for knowledge transfer, technology dissemination, and capacity building which collectively leads to inclusive growth and economic prosperity.

As countries continue to explore avenues for financing their developmental projects, the partnership between ECBs and MIGA guarantees can be instrumental in unlocking investment opportunities and driving sustainable development, especially in India.

In the context of DFCCIL, it is important to note that when the DFCCIL projects initially began, they were funded by the World Bank and JICA, with the consideration of a sovereign guarantee from the Government of India. However, the DFCCIL has now gained recognition in the market, and even foreign lenders have such confidence in its model that they are eager to associate with DFCCIL by providing funds through External Commercial Borrowings (ECBs) supported by MIGA guarantee.

Taking the lead, DFCCIL has recently issued a Request for Proposal (RFP) for a USD 100 Million ECBs, backed by the guarantee of Multilateral Investment Guarantee Agency (MIGA). If successful, this will mark the first instance of MIGA providing infrastructure finance in India, serving as a model for a new financing approach that can be replicated by other public sector undertakings (PSUs) or state-owned enterprises in India.

SAP-ERP Implementation in DFCCIL

Ajay Singh
AGM/IT

SAP is an enterprise resource planning software developed by the company SAP SE. Enterprise resource planning (ERP); software is usually modular software made to integrate the main functions of an organization's core business processes into a unified system. An ERP system consists of software components, called modules, that each focus on an essential business function, such as finance and accounting, human resource, production, materials management or customer relationship management (CRM). Organizations only use the modules they need to run their particular business. SAP is considered one of the most robust ERP software and certainly most popular ERP solution.

Adoption of ERP software is one of the key development in the initiative of Digital India by adopting State of Art - Information and Communication Technologies (ICT). In Dedicated Freight Corridor Corporation (DFCCIL), SAP has been implemented to automate its key business process i.e. Human Resource Management System, Financial Management System, Material Management System, and Employee Self-Service Portal. There have been significant developments done in SAP to make it more useful for the DFCCIL

FICO Module:- One of the biggest roadblock in using the SAP to its fullest potential was non availability of opening balances in FICO module. During the Finance and Accounts Review meeting held in May 2023, the issue was deliberated in detail & it was decided that this long pending issue of opening balances needed to be sorted out in a time bound manner. After considering several options, a fresh cut-over w.e.f 31.03.2023 was approved. Based on this, detail strategy with clear timelines was prepared for time bound cut over activities on SAP.

In the initial phase from June to August, templates for data upload were created. Financial as well as executive department officials were sensitized through one-to-one interaction, VC sessions and handholding. After extraordinary efforts put up by all the CGM units & various departments of corporate office all the important data were collected in requisite formats. Testing of this data were done thoroughly on quality server and necessary updates were also done.

However the battle has just begun, all of this humongous data were required to be uploaded in production server. For this a black out period was taken from 01.09.2023 to 20.09.2023 and this data uploaded in Production sever after due checks and data sanitation through backbreaking efforts of SAP team, which worked tirelessly day & night during this black out period. After system was made live on 22.09.2023 smooth running of payroll was ensured for September 2023.

The reconciliation of the data uploaded has been completed. With the Opening balances updated SAP has been made concurrent. Units are performing the verification exercise as of now and now DFCCIL is on the cusp of discontinuing dual system of accounting.

Besides above, during the current year major sub modules like Loan module for JICA, Budget Module for Capex, Bank Guarantee, Bank Reconciliation were also made live.

HCM Module:- Induction of officials whether on Direct recruitment, Deputation absorption or re-engagement is done on SAP and all activities related to officials is tracked on SAP.

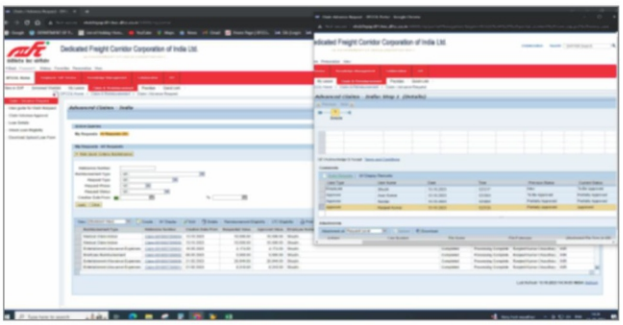
The payroll of the employees is being processed through SAP. Employees can apply for leave online, which is sanctioned and accounted for in SAP. Employee's claims including claims for Hard and Soft Furnishing, Entertainment Allowance, Mobile / Landline, leave encashment, Brief Case and Lease Accommodation etc. are processed online through Employee Self Service Portal. Employees are also filing Property Returns online in SAP. Income Tax statement / Form 16s are being generated through SAP.

During the current year the work of off-cycle payments and lease payments has been made available at CGM unit level. NPS module for IDA officials has been configured in SAP. Based on inputs from HR/Finance departments, changes in various policies e.g income tax changes in lease, changes in dearness allowances etc have been implemented in SAP.

MM Module:-During the current year, Materials Management Module has been made live and inventory management sub module has been being put in place. Inventory has been matched and updated on SAP to issue all goods thru the system and reconcile the same on SAP itself. Data of Inventory as on 31-03-2023 has already been uploaded in production server by SAP team itself. Further updating of inventory needs to be done by respective units.

Training & Support: All the manuals containing step by step procedure & screenshot have been uploaded on intranet for reference. Also, these are being updated regularly. Further for some complex procedure detail video help files has also been prepared & uploaded on the intranet. Moreover, regular trainings to all officials is being held both through online and offline mode. Offline trainings were conducted for officials of Corporate Office, Noida, Jaipur, Ajmer, Mumbai(N), Mumbai (S), Prayagraj(E), Prayagraj(W), DDU, Ahmedabad, Ambala, Tundla & Vadodara units. Besides this handholding support is provided on daily basis.

In-house team of SAP consultants has been strengthened greatly to assist and implement new developments in SAP. For this, SAP consultants with expertise & experience in the relevant field are being hired through NISG & NICSI. This team has been instrumental in resolving many issues that have plagued SAP implementation.



Way Ahead :-

Many new features are being enabled to ease the working in SAP which includes:-

1. Indoor medical treatment reimbursement,
2. TA of officials thru ESS,
3. Pay slip on WhatsApp for re-employed and officials below E0
4. Implementation of Loan module for World Bank
5. Budget Module for Opex.
6. Improvements in Material Management Module.
7. Implementation of Sales Module.

Rail Infrastructure is a heavy manpower dependent industry specially in the context of India. A fully developed SAP has the potential to fuel the growth of DFCCIL without burdening it with huge manpower cost by automating its process.

"Don't tell people how to do things, tell them what to do and let them surprise you with their results."

- George S. Patton

Future Ready, Modern Track Technology Solutions by Plasser India

Plasser India is a subsidiary of Plasser & Theurer, Austria, a global leader in the design and manufacture of the most up-to-date and highly sophisticated machines for track maintenance, track laying as well as track renewal. Plasser India's partnership with Indian Railways is more than five decades old dating back to 1965 when we delivered the first track maintenance machine to the Indian Railways. Ever since then we have been fully aligned to the vision of "Make in India" and have been providing end-to-end solutions for all track sequence works by driving innovation, eco friendliness and cost efficiency for our customers.

Plasser India's partnership with DFCCIL began way back in 2017 when we started supplying our fleet of high-performance track maintenance machines for various purposes like track laying, tamping, ballast cleaning, ballast distributing and profiling, stabilization and consolidation for the Dedicated Freight Corridor project. This is the most ambitious and largest project ever undertaken in the railway infrastructure sector in India.

Machines were mainly supplied to private infrastructure companies like Larsen & Toubro, TATA Projects and GMR Infrastructure who are the main contractor for laying the complete Eastern & Western corridors of DFCCIL network.

Plasser machines have helped DFC to accelerate the speed of

construction by not only careful handling and placement of rails but also by achieving the highest quality, precision and reliability in various track maintenance works.

Today, we have become a partner of choice for the Machine-Fleet - Infrastructure requirements of DFCCIL.

Plasser India has extended its partnership with DFCCIL with the provision of life enhancement services of Operation & Maintenance. We operate and service machines like tamping, ballast cleaning, ballast regulating, stabilizing and consolidating machines operating at different sites and stretches of the Western and Eastern corridor of DFCCIL.

This is being carried out by our team of specialist machine operators and technicians who follow the best practices in inspection, repair and maintenance ensuring that the machines are operating safely and efficiently.

Today, Indian Railways is undergoing dynamic growth and technological transition at a speed and scale like never seen before. Simply put, a rail revolution driven by digitalization and sustainability is already on a fast track and we at Plasser India are well equipped for this new era in track construction and maintenance.

It is Plasser India's endeavour to fully support DFCCIL with complete maintenance of the newly created DFCC tracks through some of our smart and intelligent solutions. We are creating added value for DFCCIL by improving the interaction between machine - fleet -infrastructure through our various digitalization initiatives resulting in greater output in an even more precise manner with less time available.

Our new approach of "Plasser Smart Maintenance" offers an intelligent link between the relevant data on the infrastructure and the machines - in real time, in one system enabling excellent fleet management.

Plasser India track maintenance machines provided to DFCCIL are already equipped with a smart solution called "Plasser Datamatic" which is a standardised interface between GPS data, engine data, filling levels and working parameters. After activation, it will help DFCCIL monitor multiple parameters like machine position via GPS, machine health progress in both graphical and numerical format and other key information in real time which is extremely crucial to operation managers and schedulers.

The "Internet of Machines" will grant operators and decision-makers digital access to our track maintenance machines. Using the latest sensor technology and test users, we develop modern interfaces for communication, evaluation mechanisms, and digital tools for maximum performance.

Also going forward, we are capable of offering "Plasser Smart Tamping - The Assistant", a turnout tamping assistance system that has made a revolutionary step towards the automation of tamping machines. It will simplify tamping in turnouts and crossings, with no extra measuring run needed and in turn meet DFCCIL's desire for a higher level of automation and transparency.

The usage of these types of new and innovative technologies are turning out to be game changer for DFCCIL.

Along with smart technologies, sustainable, resource saving and clean solutions in the construction and maintenance of rail infrastructure will continue to remain our focus and we are in an excellent position to set groundbreaking standards like ever before.

Plasser India is 100 % committed to the success of DFCCIL!!!

Hot Axle Box Detector (HABD)

Rajeev Roushan
Dy. GM (Mech)/CO

Introduction:

Hot Axle Box Detector (HABD) is an automated wayside detection system for detecting hot axle boxes of rolling stock by monitoring the temperature of the bearings. HABD may be of single beam or multi beam with track side or sleeper mounted.

Fig: (i) : Hot Axle Box Detector (HABD)

Features of HABD :

I. The system has the capability to capture the data of high speed trains hot axle up to the speed of 160 Kmph.

II. The data can be viewed and monitored through computer, smart TV as well as through mobile phone.

III. The system can detect the loco, coach and wagon.

IV. The System can generate "SMS".

V. The system can generate "Visual Alarm" in the main display screen.

VI. The system has the capability to detect the direction of trains (UP/DOWN).

VII. The system has the capability of storing the data through cloud server.

VIII. The system has capability to function either directions of movement of train.

IX. The system has capability to detect hot axle temperature timely and communicate to central control room via alarm as well as to authorized person via "SMS".

X. Color discrimination of the various temperature alerts.

XI. Setting of temperature can be customized as per requirements.

XII. Report generation for each and every train.

XIII. Self-diagnostics features (To check whether the system is working in all respect or not)

XIV. It can generate various managerial reports for analyzing the performance of HABD system.

Similar equipment and function :

HBD (Hot Box Detector): It is as same as HABD.

HAHW (Hot Axle & Hot Wheel Detector): It is a wayside detection system for detecting hot axle boxes & hot wheels by monitoring temperature of the bearings, wheel rim/disks and brake disks.

ABD (Acoustic Bearing Detector): It monitors the acoustic signature of each axle bearing passing the system at line speed.

OMRS (On line monitoring of Rolling Stock : OMRS is a way-side inspection system consisting of Acoustic Bearing Detector (ABD) and Wheel Impact Load Detector (WILD) / Wheel Condition Monitor (WCM) to detect the faults in the bearings and wheels of rolling asset.

WILD (Wheel Impact Load Detector): It is an intelligent, unmanned wayside system that measures the impact load of wheels on the railway track.

History:

Hot axle box in rail wagons/coaches occurs due to inadequate wheel bearing lubrication, bearing failure, etc. This causes increase in temperature of the axle box leaving it undetected, the temperature can continue to rise until there is a bearing "burn-off" which may cause a derailment. Currently hot axles are detected by manual methods, deploying manpower in rolling-in/rolling out areas for visual monitoring of the rolling stocks. For measuring temperatures of bearings, handheld pyrometers are recently being used.

Need of HABD in DFC:

Hot axle is one of the major problem due to which trains get detained. Due to hot axle, train may get involved in axle box breakage, bearing seizure and derailment in addition to disruption of traffic. Over DFC, the speed potential of rolling stock is higher than IR and block section is approx. 40 Km. In Indian Railways, there are manned level crossings and operating cabins in between two stations, but in DFC routes, there are no such provisions as there are very limited level crossings (that too will be eliminated) on DFC network. As there are no gateman to look out for any abnormality on passing train, hence hot box cases during en-route would cause detention of train in block section effecting the entire traffic movement of that route.

Initially, there was no wayside equipment for monitoring of health of rolling stock over DFC particularly for detecting hot axle of rolling stock. Some thoughts in this regard have come after incidences of two hot axles identified in the month of May'21 and Oct'21. Major accidents would may occur due to these hot axles. Interaction with various ZR's firms and RDSO was done for the installation of HABD over DFC routes. Finally, to detect hot axle in time, it has been realized to install such unmanned wayside equipment over DFC routes to alert the staff in case of any abnormality.

Fig (ii): Hot Axle Box

Fig (iii): Hot Axle Box

Advantages:

- Provides alert for hot axle before an act of occurrence.
- It can also identify brake binding

Criteria for selecting site for installation :

I. Nearest availability of power supply
II. Straight track
III. Accessibility of location so that engineer can maintain on day-to-day basis
IV. Internet connectivity

Concepts & Working principle:

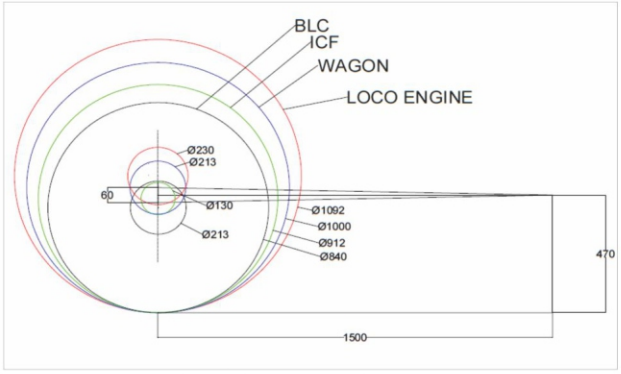


Fig (iv): Focus point of IR Sensor

Above figure illustrates the working principle of HABD. HABD System consists of two recording devices one (proximity sensor) for counting the axles and the other (infra-red thermo sensor) for recording the axle box temperature.

The Intelligent field data processing unit continuously monitors the status of proximity sensors. In normal condition, proximity sensors remains high. When the first axle of the vehicle touches proximity sensor, it becomes low and starts counting the axle numbers. Intelligent field data processing unit starts capturing LH & RH temperature of the axle box with the axles passing over. The front-end software program running on the computer captures the readings and stores them on the database with timestamp (Date and Time of Recording) and axle box number.

After the passes of all axles, if there is no more axle to count, the intelligent field data processing unit will recognize it as complete train crossed. This will be sensed by front end program running on PC and assign a train number to the saved data and transfer the data to centralized web server. The application page gives color indication and buzzer sound when the temperature of axle box is more than configurable temperature or the difference in temperature between two axles in a rolling stock exceeds configurable temperature.

This system covers all types of rolling stocks (loco, LHB, ICF, wagons of 1000 mm & 840 mm wheel size). In figure (iv) it shows that there is a 60 mm vertical distance which is common for all the stocks on which IR sensors focused for measuring the temperatures of bearings.

Challenges over DFC for installation of HABD:

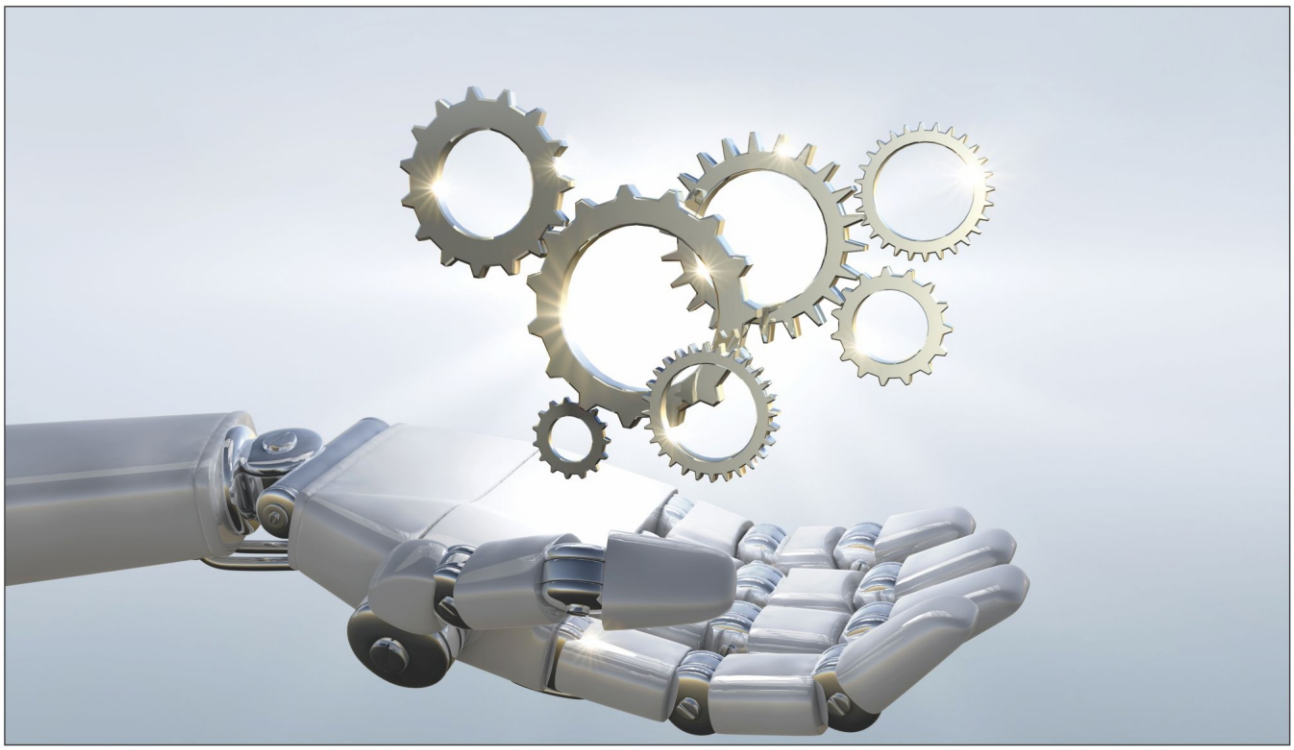
As per SOD of Indian Railways, any structure to be put 2360 mm from the centre line of track. But as per SOD of DFC, it is 2825 mm which means that the capacity of Infrared sensors should be more powerful which should be able to measure the temperatures of bearings accurately even far from the track. Also, rails are different in EDFC & WDFC. Hence, clamping arrangements of proximity sensors in EDFC & WDFC are different which should be more precise else incoming stocks would not be detected.

Installation & performance of HABDs over DFC:

Initially, seven HABDs (04 on WDFC and 03 on EDFC) have been installed. Alert was set at 75°C for individual bearing temperature and 25°C for difference of two bearing temperatures on same axle. Alert generates either of these two criteria. It was observed that high false positive alerts were received which caused interruption in the movement of traffic over DFC. After that, an analysis was done on the basis of trends of bearing temperatures received & actual reason found and raised the temperature setting of 25 to 30 °C. Many hot axles and brake binding cases have been observed with the least false positive percentage. On the basis of the performance of HABDs, DFC has decided to install HABDs in every block section. Till date, total 71 HABDs have been installed over DFC routes.

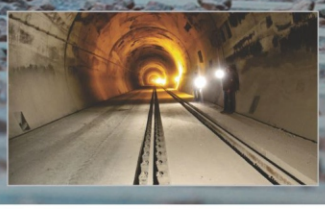
Way forward:

DFC has installed track side single beam HABD at a very low cost whose performance is satisfactory till date. These HABDs can detect averted hot axles as well as brake binding which causes flat tyre, rail fractures etc. It would be interlinked with other way side equipments and RFID readers which would also be provided on the track side so that these equipments can be synchronized with each other. This system would be very helpful at the time of emergencies for monitoring of en-route unusual.



Monetisation of Railways: The way ahead

Sh. Ankur Yadav
AM/Finance



On 23 August, 2021 Union Minister for Finance and Corporate Affairs, Smt. Nirmala Sitharaman, has launched asset monetisation pipelines of central ministries and public sector entities: "National Monetisation Pipeline (NMP Volumes 1&2). This pipeline has been based on the mandate of 'Asset Monetisation' under Union Budget 2021-22 and developed by NITI Aayog in consultation with Infrastructure Line Ministries. NMP estimates aggregate monetisation potential of Rs. 6 Lakh crore through core assets of central government over a period of 4 years from FY 2022 to FY 2025.

NMP includes assets of various Ministries wiz. Roads, Transport and Highways, Railways, Power, Pipeline and Natural Gas, Civil Aviation, Shipping Ports and Waterways, Telecommunications, Food and Public Distribution, Mining, Coal and Housing and Urban Affairs.

The top 5 sectors (by estimated value) capture 83% of the aggregate pipeline value. These top 5 sectors include: Roads (27%) followed by Railways (25%), Power (15%), Oil & Gas pipelines (8%) and Telecom (6%)

What is Asset Monetisation:

Asset Monetisation, commonly referred to as asset or capital recycling, is a widely used business practice. It consists of limited period transfer of performing assets to unlock idle capital and reinvesting in other assets or projects that deliver improved or additional benefits.

Asset monetisation entails a limited period license/ lease/ transfer of an asset owned by the Government or public authority, to a private sector entity for an upfront or periodic consideration.

The transfer of rights for upfront or periodic consideration are defined through contractual framework. The role and responsibility of private party is to operate and maintain the asset as per contract and generation of returns through higher operating efficiencies and enhanced user experience. Funds received by public authority will be used for any other project or public purpose. Such contracts include provision of transfer of ownership of assets back to public authority after the end of contract.

Identification of Assets

The assets of government/public sector entities/statutory bodies can be divided into core assets and non-core assets. Core assets are the assets which are central to the business activities of such entity and used for delivering infrastructure services to the public/users considered as Core Assets. Other assets, which include land parcels and buildings, are categorized as non-core assets. In case of Indian Railways, Station Buildings and tracks have been identified as Core Assets.

Core Asset Monetisation Framework

The framework for monetisation has three key imperatives:

1. Revenue rights are monetised; however, ownership still remains with the public authority. Assets will be handed back to public authority at the end of transaction life.
2. Assets are already under operation by public authority and have a stable revenue stream.
3. Asset monetisation will be done through structured partnership well defined through contractual frameworks with strict Key Performance Indicators (KPIs) and performance standards.

Monetisation Models

Asset monetisation can be done through various models. Monetisation models which are being currently used, can be broadly classified into two following categories.

(i) Direct Contractual Approach: A concession/contract between a public entity and identified private sector developer(s)/ investor(s).

(ii) Structured Financing Model: Structured instruments for long term fund generation via capital markets or through a pool of investors.

Features of both the models have been elaborated in the table given below:

Particular	Direct Contractual Mode	Structured Financing Instruments
Transaction	Assets or rights over assets transferred to single or consortium of investors by way of defined contractual framework	Partnership interest in assets or rights over assets are granted to a pool of investors through capital market-based instruments.
Consideration	Upfront and/or periodic payments	Upfront
Target investors	Infrastructure developers, strategic investors with direct involvement/oversight in operation	Institutional investors as well as Retail Investors
Selection Procedure	Competitive Bidding process or as per prescribed guidelines of government	Public listing or private placement or other such mechanism
Prevalent Structure	PPP Concessions	Infrastructure Investment Trust (InvIT), Real Estate Investment Trust (REIT) etc.

Asset Monetisation in Indian Railways

For Railways, Target of monetisation has been set at Rs. 1,52,496 crores for a period of 4 years from FY 22-25.

Key assets for monetisation over FY 2022-25

Assets	Nos/Kms	As a percentage of Potential Asset Base
Railway stations	400 Nos.	5.5% of stations
Passenger trains	90 Nos.	5% of total trains
Railway track	1 route of ~1,400 km	2% of network
Konkan Railways	741 km	
Hill Railways	4 Nos., 244 route Kms	
Railway owned Goods Shed	265 Nos.	21% of total goods shed
DFC Track and allied infrastructure	673 Km	20% of total DFC Network
Others- Railway Colonies & Stadiums	15 railway stadiums and selected railway colonies	

For achieving this target, following assets are identified and approach regarding their monetisation value is elaborated in the table:

Assets	Approach to monetisation value
Railway Stations	Capex approach
Passenger Trains	Capex approach
Private Freight Terminals	Capex approach
Railway Colonies redevelopment	Capex approach
Track Infrastructure under DFCCIL	Book Value approach
Track, OHE	Economic Value approach

Year wise target of monetisation of assets of railways

Asset Type	FY 22	FY 23	FY 24	FY 25	Total
Railway Station Development	40 Stations	120 Stations	120 Stations	120 Stations	400 Stations
Passenger Train Operations		30 Trains	30 Trains	30 Trains	90 Trains
Track OHE InvIT		1400 Km			1400 Km
Goods Shed		75 Nos	100 Nos	90 Nos	265 Nos
Konkan Railway			741 Kms		741 Kms
Hill Railways	2 Nos	2 Nos			4 Nos
Dedicated Freight Corridor			337 Km	337 Km	673 Km
Railway Stadiums	3 Nos	5 Nos	5 Nos	2 Nos	15 Nos

Year wise target of monetization (Rupees in crores)

As per the details mentioned above, Central Government has set ambitious targets for assets monetisation in Railways from FY 22 to FY 25. The successful implementation of asset monetisation hinges on effective governance framework with escalation matrix for real time monitoring of progress. This will help in monitoring the implementation of projects by comparing actual progress vis-à-vis planned timelines. This programme is envisaged to be supported through necessary policy and regulatory interventions by the Government to ensure an efficient and effective process of monetisation. The end objective of this initiative is to enable 'Infrastructure Creation through Monetisation' wherein the public and private sector collaborate, each excelling in their core areas of competence, to deliver socio-economic growth and quality of life to the country's citizens.

Ullhas Bridge on WDFC Section

News from Indian Railways

PM Modi lays foundation stone for redevelopment of over 500 railway stations across India

Prime Minister Narendra Modi has laid the foundation stone for the ambitious redevelopment of 508 railway stations across the country on 5th Aug'23. The PM took part in the ceremony virtually via video conferencing.

The PM, after laying the foundation for the redevelopment project, stated that at present, India holds the attention of the entire world. He emphasized that India's prestige on the global stage has witnessed a notable rise. "The world's perception of India has undergone a transformation, and this can be attributed to two key factors – firstly, the election of a full majority government after almost three decades by the Indian people, and secondly, the relentless efforts of this majority government in addressing the nation's challenges and working towards sustainable solutions," Modi said during the ceremony.

He described India as being on the path towards development, akin to the dawning of the Amrit Kaal (a propitious time in Hindu mythology), and said that this era is marked by fresh vigor, renewed inspiration, and unwavering determination, and in this optimistic spirit, a new chapter is unfolding in the annals of Indian Railways, symbolized by the commencement of the redevelopment of 508 railway stations.

PM Modi inaugurates world's longest railway platform in Indian state of Karnataka

Indian Prime Minister Shri Narendra Modi on Sunday inaugurated the world's longest railway platform of 1.5 kilometres at Sri Siddhaarooda railway station in Hubballi in the Indian state of Karnataka.

It should be mentioned that the Hubbali station of Indian Railways' South Western Railway Zones is now listed as having the world's longest platform in the Guinness Book of World Records.

An investment of Rs 20.1 crore was made to build this platform as part of the railways' initiative to renovate stations.

The construction began in February 2021 and is now finished. The station connects Hosapete (Gadag side), Vasco-Da-Gama/ Belagavi, and Bengaluru (Davanagere side) and is a crucial crossroad in Karnataka (Londa side).

The aspirational project was very crucial to better meet the city's rising needs. Three additional platforms have been added to the existing five.

Platform No. 8, at 1507 metres, holds the record for being the world's longest railway platform. Two trains with electric engines will simultaneously depart from this longest platform. It will make it possible for trains to run in both directions.

Indian Railways reports highest ever freight loading for fiscal 2022-23

The Indian Railways has loaded 1512 million tonne (MT) of freight during 2022-23. An official statement said this is the highest-ever loading reported by the national transporter during a fiscal. The railways had loaded 1418 MT during FY 2021-22.

During FY 2022-23, IR has achieved revenue of Rs 2.44 lakh crores as compared to Rs 1.91 lakh crores during 2021-22 registering an increase of 27.75%. More over, in First half 2023-24, freight loading further increased by over 1% to 758 MT.

In addition to loading, Indian Railways also set records of track electrification, laying of new lines, and automatic signalling among others during the year. In order to increase its model share in freight segment, Indian Railways said it is prioritizing development of Gatishakti Freight Terminals. 30 Freight Terminals were created as compared to 21 Freight Terminals in 2021-22.

Railways to launch freight version of Vande Bharat Express; to run as 'superfast' parcel service

A freight version of the semi-high-speed Vande Bharat Express is likely to be introduced by the Railways. Its first service will be operated between the Delhi-NCR and Mumbai regions.

The freight train was christened the "Freight EMU" and will serve as a superfast parcel service that is aimed at capturing high-value and time-sensitive cargo consignments which are currently being moved through other forms of transport. This was decided and the information was sent in letters from the Railway Board

The new freight trains have been designed for palletised container transportation at a speed of 160 km/hour. The 1,800-mm wide rakes with automatic sliding doors would have provisions to load reefer containers for temperature-sensitive cargo, a pneumatically retractable roller floor system with locking facility for easy handling of pallets, and a total payload of 264 tonnes.

The Integral Coach Factory in Chennai, which is manufacturing the bulk of the Vande Bharat trains, is expected to roll out the first freight EMU rake on the Vande Bharat platform in December, sources said.

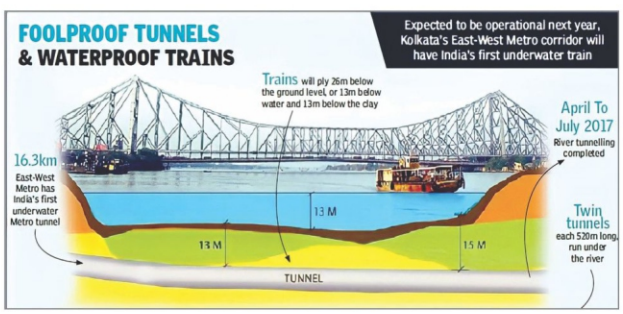
The first service of the train is likely to be undertaken based on the interactions with some potential customers. Zonal Railways have been requested to identify and interact with the potential customers and identify the terminals for running the initial services.

India hands over 20 broad gauge locomotives to Bangladesh

India on Tuesday handed over 20 broad gauge (BG) locomotives to Bangladesh, fulfilling a commitment made to Prime Minister Sheikh Hasina during her visit here in October 2019. The handing over ceremony was attended by Railway Minister Shri Ashwini Vaishnaw and his Bangladeshi counterpart Md Nurul Islam Sujan virtually. "It's a matter of great pleasure that India has given 20 modern diesel locomotives to Bangladesh. Earlier, out of 9 old connections between India and Bangladesh, five have been revived, work on two is underway and preparations are on for the remaining two", Ashwini Vaishnaw told reporters.

India's first underwater metro completes trial run

Kolkata is set to welcome India's first underwater metro train which will allow commuters to travel across the Hooghly river which separates West Bengal's capital from Howrah.Trial run with passengers successfully completed on April 20, 2023. Tunnel under the river Hooghly has internal diameter of 5.55 meters. The construction of the tunnel is completed with the help of a tunnel-boring machine (TBM). The German-made TBMs named Prerna and Rachna finished the task in a record of 66 days. Authorities took multiple measures to prevent water inflow and leakages in the tunnel. The concrete mixes composed of fly-ash and micro-silica were used to avoid the permeability of water.



The task was particularly daunting as the areas around the area of underwater tunneling had many historic buildings and the authorities had to make sure that the buildings don't receive any damage as part of the process. The East-West Metro Corridor in Kolkata connects the IT hub of Salt Lake Sector V in the east to Howrah Maidan in the west, crossing the river. By taking this metro route, the travel time between Howrah and Sealdah can be reduced to 40 minutes compared to 1.5 hours by road, thereby decongesting road traffic.

> **"Leadership is the capacity to translate vision into reality."**
>
> **- Warren Bennis**

Elsewhere in World Railways

Batteries and hydrogen could replace diesel for heavy haul freight

AUSTRALIA: AUSTRALIA's largest freight operator, Aurizon and the University of Queensland have concluded that a combination of batteries and hydrogen could feasibly replace diesel power on the nation's heavy haul routes in the coming decade.

In a paper published in the Journal of Energy Storage, Dr Ruth Knibbe and Prof. Paul Meehan from the University's School of Mechanical and Mining Engineering collaborated with Aurizon to analyse rail corridors across Australia.

Researchers developed an energy model to assess each route's required energy and potential regenerated energy with the tractive and regenerative battery energy, mass, and cost determined using data from the energy model coupled with battery specifications. The feasibility of deploying lithium iron phosphate (LFP), nickel manganese cobalt (NMC) and lithium titanium oxide (LTO) batteries in heavy haul traction applications were examined considering cost, energy density, cycle lifespan and locomotive data, with LFP identified as the most suitable current battery solution.

Further examination of the energy demands, and associated mass/volume constraints concluded that three platforms are required for heavy haul rail decarbonisation: a battery electric locomotive for low-energy demands which can be coupled with either a battery electric tender for medium energy demands or a hydrogen fuel cell electric tender for higher energy demands.

The researchers found battery-operated trains which could replace diesel locomotives on shorter, low-energy routes such as the 200km Gladstone - Moura corridor in central Queensland.

China's First Intelligent Heavy-haul Train Launched on the Shenmu-Shuozhou Railway

CHINA: Last year "3+0" intelligent 10,000-ton heavy-haul train officially began running on the Shenmu-Shuozhou Railway. Combining new technologies such as integrated radio frequency sensing technology, the Internet of Things, cloud computing and next-generation communication technology. The intelligent train marks a major breakthrough in the development of Chinese heavy-haul freight rail and heralds a new stage of intelligent heavy-haul rail development in China.

The launch of the "3+0" intelligent 10,000-ton heavy-haul train created five "firsts" in the world: First, autonomous driving of a 10,000-ton heavy-haul train on a 12/1000 gradient uphill line is achieved, which reduces operating intensity and

difficulty for the driver. Second, automatic locomotive operation is achieved, which improves transportation efficiency. Third, automatic shunting operation based on obstacle detection (dual radar + video recognition) and shunting signal protection is achieved, which enhances rail safety. Fourth, based on differential positioning of BeiDou Navigation Satellite System, precise control of the locomotive is achieved. Fifth, environmental meteorological information is introduced into the locomotive for the first time to provide reference and decision-making basis for train operation.

The successful operation of the intelligent heavy - haul train on the Shenmu - Shuozhou Railway is a technical revolution in the field of 10,000-ton heavy-haul train operation in China, which will lead the heavy-haul freight railway to the direction of intelligent design. This also indicates that China has been at the forefront of railway development in the world in the field of freight heavy-haul train control.

The world's first 100% hydrogen-powered train starts running in Germany

GERMANY: French-based company Alstom broke new ground in transportation. The company announced the world's first hydrogen train, the CoradiaiLint, reached Bremervörde, Lower Saxony, Germany.

The trains are emissions-free and low-noise, with only steam and condensed water issuing from the exhaust. They have a range of 621 miles (1,000 km). It means that each train can run the entire day with a single tank of hydrogen. Just 2.2 pounds (1 kg) of hydrogen fuel can do the same as around 9.9 pounds (4.5 kg) of diesel.

Maximum speed is 140 kph, or 87mph, though regular speeds on the line are much less, between 80-120 kph.

With this breakthrough, it has been aimed to contribute to the greenest rail network globally, Alstom says.

"Emission-free mobility is one of the most important goals for ensuring a sustainable future and Alstom has a clear ambition to become the world leader in alternative propulsion systems for rail," says Henri Poupart-Lafarge, CEO and Chairman of the Board of Alstom.

Switzerland created record for operating the longest passenger train

SWITZERLAND: Switzerland is now home to the world's longest passenger train. The train has 100 coaches, measures 1910 metres and consists of 4,550 seats. The train was seen passing through the mountainous landscape in the Swiss Alps last year.

While there are freight trains that are longer, the Rhaetian Railway announced that it had beat the world record for the longest passenger train. It was announced at an event marking the 175th anniversary of Switzerland's railway system.

The train carried 150 passengers on its journey. It wound through dazzling sunshine reflecting off its shiny-silver roof. The train also comes with a digital destination sign on the front that reads "Alpine Cruise" It took the spectacular Albula-Bernina route, listed as a

UNESCO World Heritage site. The route covered nearly 25 kilometres from Preda to Alvaneu in less than 45 minutes. It passed through 22 helical tunnels and crossed 48 bridges on its way.

Driverless heavy haul railway expanded to serve automated iron ore mine

AUSTRALIA: A 166 km branch has been built to connect Rio Tinto's new Gudai-Darri iron ore mine in the Pilbara to its 1 700 km heavy haul network, which is operated using Auto Haul driverless trains. The first loaded train ran in June, with production scheduled to ramp up to reach full capacity during 2023.

Rio Tinto's 17th and 'most technologically advanced' iron ore mine in the Pilbara was developed at a capital cost of A$4•3bn. It has an expected life of more than 40 years and an annual capacity of 43 million tonnes.

Hitachi Rail is the technical lead for Auto Haul, and provided the onboard and control centre technology, track side equipment, radio

base stations and automatic train operation interface software for locomotive control, level crossing safety and location tracking.

Right The Very First Time

Praveen Kumar
ED/AM/WDFC

A web search on 'Right The Very First Time' will fetch over million results in a fraction of a second. With plethora of useful information available on How to do the things correctly, why do mistakes happen, catastrophic failure occurs and project deviates from the pre-conceived plan and how DFCCIL working diligently for ensuring 'Right The Very First Time'.

In human history, there have been countless mistakes made, an unimaginable number of things did not serve the intended purpose, and many projects have either over-run, gone over budget or predominantly both (there are the projects we hear about quite frequently whereas the successful ones almost go unnoticed). No one can doubt as DFCCIL relentlessly heading into the bright future that these events and issues are going to happen time and again.

As engineers, we believe that the exploration & implementation of new technology, new ways of working, new process, treating contract a dynamic & contextual entity, and new approaches is a part of DNA of DFCCIL. We strive for the future to be better, promising, more efficient, lower cost of operation and maintenance, higher throughput and ultimately more time for taking up the new ventures like Business development, more & more Dedicated Freight Corridor. With each step of exploration, we encounter risk and immediately work towards its mitigation.

A very Big Ask

Getting the project conception right, the budget right, the design right, the construction right, the logistics right, the interface management right and doing all this 'Right The Very First Time'. It is quite justifying to have 'Big Ask' about the most desirable Project Organization. Some believe their only time to engage with the Project Journey is at the 'Design Stage', but we challenge that belief, and our engineers & all the employees immerse themselves in every project from concept to closure. With this attitude, as the prime mover, about 77.2% of the DFC has been commissioned & the impact is widely visible.

Construction in progress of Rewari Tunnel

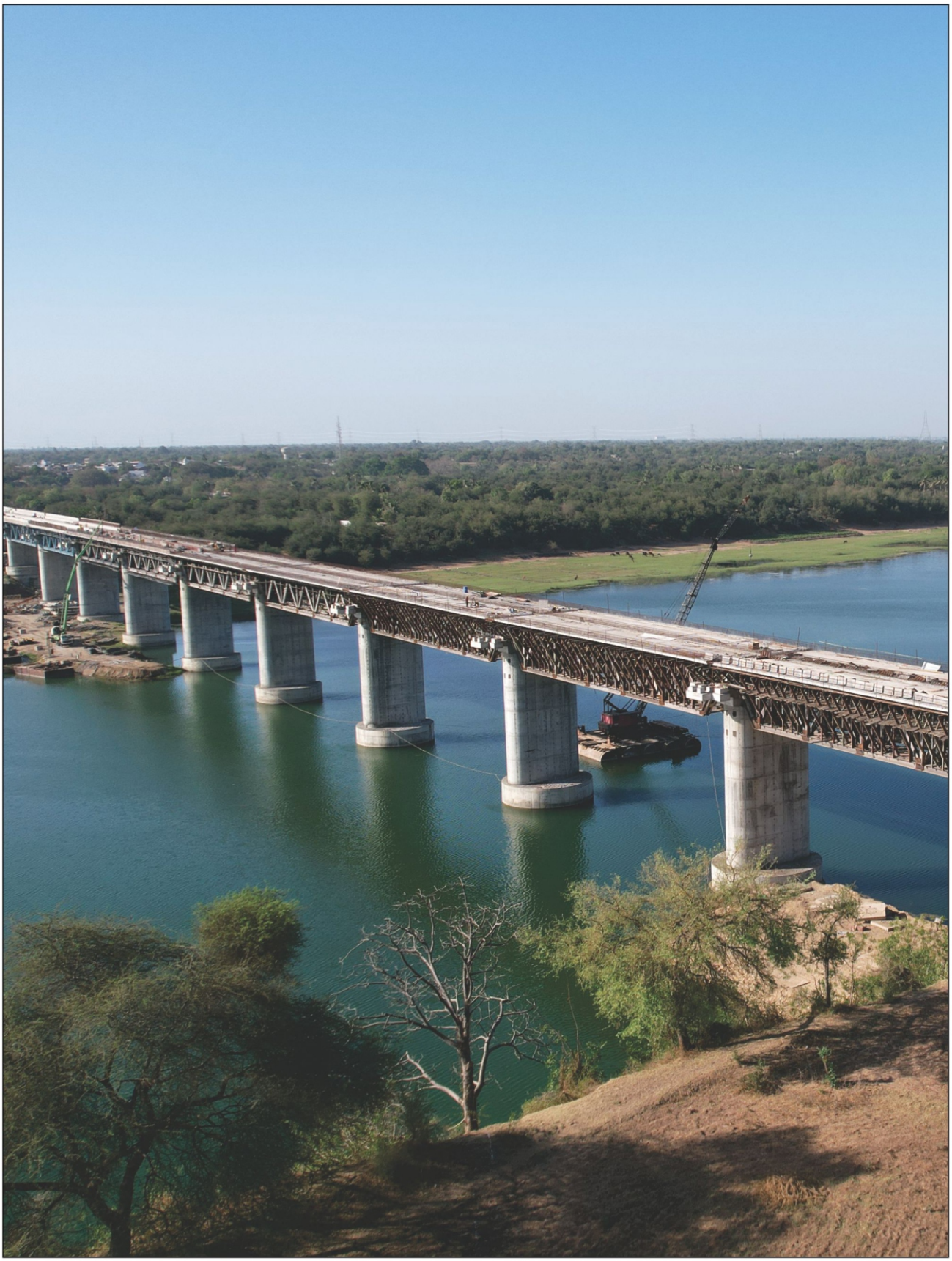
In the delivery of DFC, we have strived for 'Right The Very First Time' by working closely with all the stakeholders like The Engineers, The Contractors & their Sub-Contractors, State & Central Government, PAPs, etc from initial discussions all the way through to the final delivery. At each stage of the project, we take incremental steps to ensure that we are heading in the right direction, our stakeholders are fully consulted along the way whenever required, our engineers & staff visits the site so as to fully understand the issues & take a proactive approach for quick resolution of the issues.

At DFCCIL, we have a dynamic & capable team that responds and adepts quickly to an ever-changing environment. As the needs arises, for example overcoming delays, we as a team collectively do whatever is the best in the project progress & timely delivery.

In all honesty, we are human, and we make mistakes like everyone else. But it's how we deal with and overcome those mistakes, learning along the way and going above & beyond, that makes DFCCIL team one of the strongest & capable I am working with.

2.7 km long Rewari Viaduct under construction

"Transportation is the backbone of a nation's progress, carrying dreams, ambitions, and innovations to every corner."



Mahi bridge in Palanpur-Makarpura section of WDFC

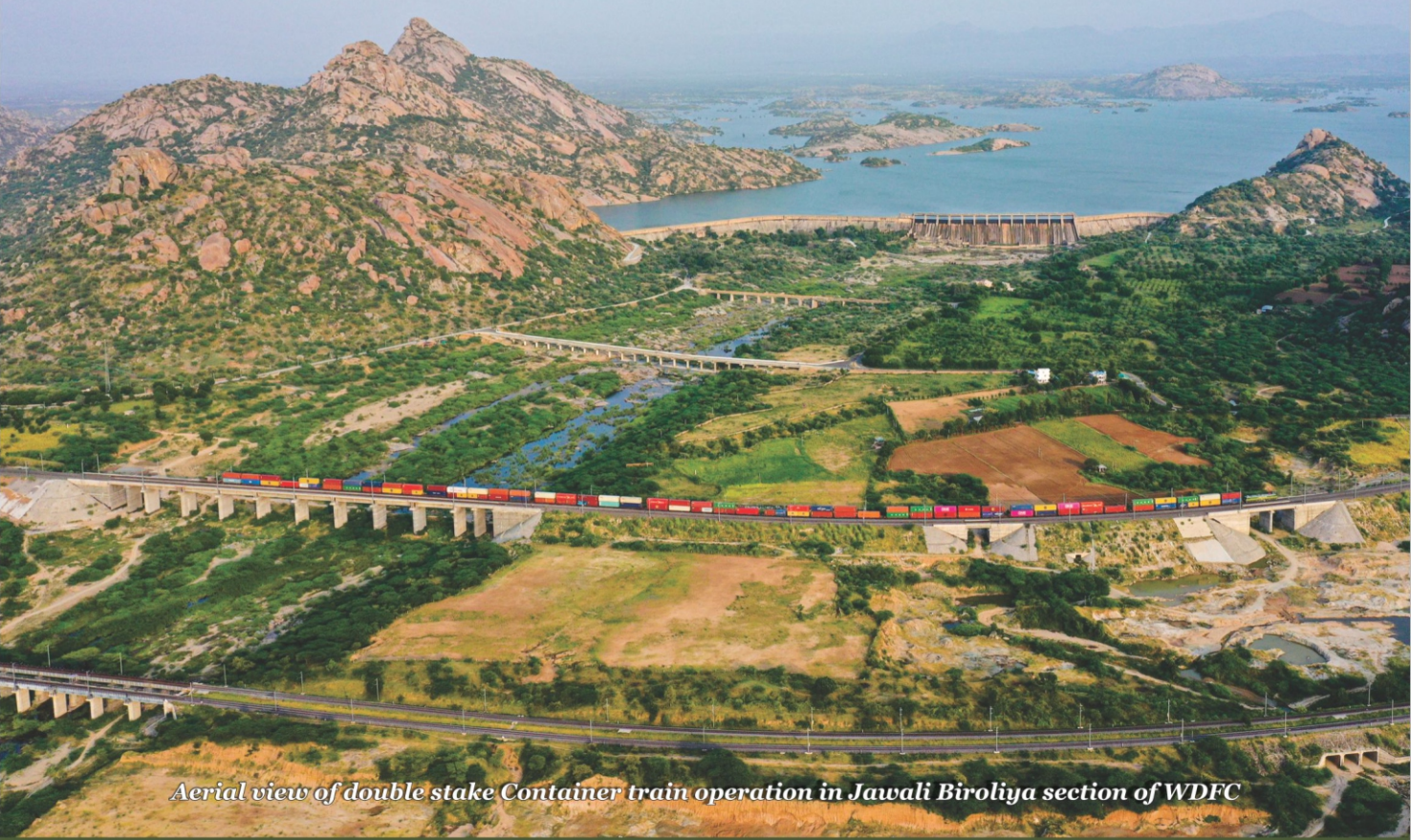
Rail welding yard in Marwar of WDFC

RFO-25 in Palanpur - Madar section of WDFC

“DFCCIL has not only created new ways of project execution, it is also setting new benchmarks in the way Indian Railway has to evolve in future. I declare DFCCIL as **The Jewel of Indian Railways**”

- Sh. Ashwini Vaishnaw

Union Minister, Railways,
Ministry of Communications,
Electronics & Information Technology



Aerial view of double stake Container train operation in Jawali Biroliya section of WDFC

डेडीकेटेड फ्रेट कोरीडोर

डेडीकेटेड फ्रेट कोरीडोर कॉर्पोरेशन ऑफ इण्डिया लिमिटेड

Dedicated Freight Corridor Corporation of India Ltd.

A Govt. of India (Ministry of Railways) Enterprise

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