By Chakarapani Srinivasa

TECHNOLOGIES IN INDIAN RAILWAYS

Ministry of Railways has invested several crore rupees for modernization and uplifts the technologies used in Indian Railways. Most of them are for speeding up and for safe travel. Let us see the various technologies works and innovations executed in Indian Railways.

DIESEL LOCOMOTIVE WORKS

India's first super diesel engine was Shakti. It is an uprated 16 cylinder 3100 HP engine, AC-DC transmission and fabricated steel trucks. This was indigenously developed brood gauge diesel electric locomotive for heavy freight haulage. This was fine tuned and 'Garuda' engine was designed with modern microprocessor controls. This design was further enhanced with special amenities, and special controls. It looks with pride with long-life color, coordinated poly urethane paint scheme, cab air conditioning, extra power sealed head lamps, fog lamps, driver signal lamps, large rear view mirrors and an ergonomically designed driver's desk. Usually the engine driver complaints about heavy vibration and unbearable noise. The cabin has been designed in such a way to lessen these burdens on the driver who is accommodated day and night. The new design with above facilities is christened as Ergo-Cab.

Its maximum speed is 100 kmph, maximum tractive effort 37884 Kg, continuous tractive effort 31920 Kg. The Brakes have 28 LAv-1 system. Loco has air brake and wheel arrangement is Co-Co.

These design details are found in WDG3A. The next version is WDG4 which has 4000 HP engine, micro processor controlled propulsion and braking with high traction high speed cast steel trucks. This engine has the General Motors USA technology with high fuel efficiency and low maintenance requirements. Axle load is 21 ton, max tractive effort 52 ton, brakes are electronically controlled air brake. It possess Gardner Denver (Water cooled) air compressor. With a fuel tank capacity of 6000 liters it has a track gauge 1676 mm and wheel arrangement is Co-Co. Locomotive control is by Em 2000 with SIBAS-16 traction control unit. Another variety in the diesel engine possessed by Indian Railways is WDP4. This has 16 cylinder 4000 HP, AC-AC transmission, microprocessor controlled propulsion and braking with high traction high speed. Maximum speed is 160km/hr. maximum tractive effort is 27550 kg. Fuel tank capacity is 6000 liters. It possess Gardner Denver (Water cooled) air compressor.

DIESEL LOCOMOTIVE WORKS

The Diesel locomotive works at Varanasi owned by govt. of India manufactures DG sets of 800 to 2400 kw capacity using DLW built engines. These engines are built using the state of art brushless type alternators from leading manufacturers with microprocessor based AVR. The DG sets have PLC based control and fault diagnostic systems. Specific fuel consumption is 153 gm / bhp-hr. Time for start is found to be ready to take load in 10 sees.

The speed of diesel generating set is 1000 rpm.

WDM3D is the most preferred diesel traction option for the user Railways in future as it has less weight with fabricated beams, lightweight traction motors, and a smaller fuel tank. The availability of microprocessor technology for excitation and propulsion control and wheel creep. Maximum speed expected is 120km / hr. The fuel tank capacity is 5000 litres. The wheel arrangement is Co-Co. It has a gear ratio of 18.65 and maximum tractive effort is 38.6 Ton.

Indian Railways always aim for 100% safety. Hence they have taken care to fix railway axel counter (PXN) a signaling equipment, destined for evaluation of the railway track sections occupancy. Each section can be defined by up to 8 registration points. Each registration point can serve as common for preceding and following track section.

CHITTARANJAN LOCOMOTIVE WORK

This is one of the biggest Mainline Electric Locomotive Manufacturing units is the world. It manufactures Traction motors utilized for Electric Locos. They are of type 6FRA 6068, three phase 850 KW, 2180 V. This plant has a capacity to manufacture around 750 traction motors per year. The output power is 1150KW, axle arrangement Bo-Bo., torque (Nom / max) : 6930 / 10000 Nm and speed is 1585 / 3174 RPM.

CENTRAL RAILWAYS

Central Railways has the credit of manufacturing 9 locomotives per month in Parelumbai. It is the largest and one of the oldest loco workshops in Indian Railways. The workshop is easily accessible by road, sea and air transport as it is located in the heart of Mumbai city. During world wars it has rendered services to Armed forces too. It has secured ISO in manufacturing and repairing of containers of Indian Railways. It was the first workshop to phase out POH of steam locomotives. It is the only workshop which undertakes POH of 140T diesel Hydraulic

breakdown Cranes of M/s. Cowans sheldon, UK's make from 1997 onwards Traction machines winding shops, smithy shop, welding shop and machine shop are in the Parel workshop. The CRLW has the credit of carrying out, POH / Special repairs of diesel Hydraulic locomotives of WDS4 / ZDM4 / ZDM5 /NDM5 Class, POH/Special repairs of Diesel / steam cranes of Central Railways, POH of Tower wagons, corrosion repairs of mainline coaches etc. Contact address c rly.cme@bom8.vsnl.net.in
. fax 91-22 4135326. contact person: Their chief workshop manager, CRLW, Dr.B.A. Ambedkar Road, Parel, Mumbai- 400 012.

WESTERN RAILWAYS:
The western Railways take the pride to be the first in the country to run state of the art LHB coaches in Rajdhani Express. The prestigious Train Management System of Western Railways on Church gate, Virar, Mumbai suburban section of Western Railways, provides real time minute to minute information of train arrivals to 3 million commuters at stations. Automatic announcements about the arrival of the trains, modified guard friendly brake van of freight trains, Suraksha Rakshak for detecting smoke emission due to brake binding and message communication of faults thro' the controller's and nearest EMU examiner's depot overhead line inspection with video recording are some of the achievements of western Railways.

The salient features of overhead line inspection are:

1. 1. The device enables testing team to monitor the current collection without disturbing the crew.
2. 2. Continuous video and voice recording for off line analysis.
3. 3. Maintenance engineers use recorded data for comparison with previous records and to assess the health of the OHE.
4. 4. The system capable of marking real time events like heavy sparking.
5. 5. Color picture helps to correct identification of the nature of the flashes.
6. 6. Device supports for identifying sports where extreme values of stagger are encountered.

The Western Railways has the privilege of being the first Railway to have Major Workshop Coaching Depots, Diesel sheds, Wagon ROH Depots and Accident relief trained certified for ISO 9002 Quality system.

Rat lam Diesel shed belonging to Western Railways was the first shed on Indian Railways to implement Environment management system and earn ISO14001 certificate.

Also the Bandra self propelled Accident relief train is the first on Indian Railways to be certified for ISO 9002.

CENTRAL ORGANISATION FOR MODERNISATION OF WORKSHOPS (COFMOW)
This is an unit of the Indian Railways. For the past 25 years COMFOW aims to upgrade workshops and production units of the Indian Railways. It handles business worth US $ 25 million annually. In order to execute all technological solutions with a new approach, it has procured a CNC turret punch press at Diesel Locomotive works at Varanasi which replaces a group of 4 load centers consisting of a bank of 8 machines where 1 operator is sufficient in stead of 10 operators.

COFMOW also executes World Bank Aided projects of the Ministry of HRD. Simulators for electric and diesel locomotives and up gradation of COFMOW training centers are some of the plus points of COFMOW growth. It has upgraded the facilities of the coaches of RCF, CLW and DLW belonging to Indian Railways.

EAST CENTRAL RAILWAYS
In Indian Railways the freight transportation has increased from 752 million tonnes to 600 million tonnes and passenger kilometers have increased from 7000 crore to 51000 crore. So for improvement in administration and for effective execution of all works 16 zonal railways were formed. One amongst it is the East Central Railways. It covers the areas like Danapur, Mughalsarai, Dhandbad (where ordinance factory is located), Samastipur and Sonapur divisions with Hajipur, Bihar as its head quarters.

The main aim of this new division was to improve the infrastructure facilities in the neglected and under developed regions in India. The fund allocation was liberal and projects worth Rs.10,000 crore were taken up. Erection of new lines, gauge conversion and doubling works are some of their main aims. It has proved to be the largest in Indian Railways in terms of passenger traffic speed, track-kilometer, goods loading and other facilities.

This has taken special care for customer service and was the first to establish call centre at Patna, the capital of Bihar.

Universal PCB tester to test and repair all analog PCBs utilized on various track machines in-house, reducing the dependence on outside agency is one of the achievement of plant depot of East Central Railway located at Mughalsarai. Also Logic Block in Unimat is another product of this division, which has an indigenous pilot operated 4 way valve with extra connection arrangement developed in-house ensuring higher availability.

The Mughalasarai has produced clutch shaft of BCM, Rail wheel base plate of T-28, Small cardon shaft of CSM.

Shift gear box housing, Eyebolt of T-28 machine and many more at an extremely low cost replacing the imported items.

SOME MAJOR BRIDGES UNDER EXECUTION IN EAST CENTRAL RAILWAYS

Ganga Railway Bridge at Digha in Patna is expected to be ready by 2007 at an estimated cost of Rs. 625 crore. The total length of this bridge including approach would be 20 km and the length of the main bridge between Digha and Pahleja Ghat would be 4.925 Km. As there is no rail link between North and South Bihar this project was taken up to face that traffic. Rail link is available only at Mokama at a distance of 93 km downstream of Patna. This new bridge between Digha and Pahleza is an useful infrastructure to improve trade and industries in that backward area.

RAIL CUM ROAD BRIDGE AT MUNGER

Ganges is a holy river where millions of Hindus throng to take bath and shed their sins as per Hindu belief. So it is an important pilgrim centre for one and all. A rail cum road bridge on Ganges near Munger has been taken up at a cost of Rs.930 crore. This 3.19 Km long bridge is 55 Kms down stream of the existing rail cum road bridge at Mokama and 68 Kms Upstream of the road bridge at Bhagalpur on river Ganges.

This magnificent bridge will connect NH31 of North Bihar to NH-80 of south Bihar and will also connect Jamalpur station of Sahibang Loop line (Malda division) of Eastern Railway to Barauni Katihar section on Sonepur division of East Central Railway. This mega bridge will support several lakh passengers from 2009 onwards.

KOSI RAIL BRIDGE AT NIRMALI

North Eastern region of India lacks sufficient infrastructure and development. Hence this bridge will restore the previous washed out rail link between Sahebpur Kamal stations on Nirmali Bhaptiahi several years back. It will be an added advantage to the residents of 098yyyytnila. The total length of this bridge is 23km and the estimated cost of construction is Rs. 323 crore. The foundation was laid by the Prime Minister to serve the downtrodden.

NEW SONE BRIDGE

This bridge is being erected on the river Sone to link Dehrion-Sone and Sonnagar stations. It is one amongst the longest rail bridge of Indian Railways stretching for a distance of 3.04km. The public will enjoy using this bridge by 2007 says the Railway Ministry officials. It will be a three line bridge with a provision for fourth line on the substructure.

WEST CENTRAL RAILWAY

The West Central railway of Indian Railways is another division working for safety and punctuality.

It has designed a work safe system to help the staff working in site. Normally a signal man is required to be positioned 1Km away from the site and is required to display a red flag on the approach of a train. Detonators are also required to be fixed on the head of the rail. These unsafe practices are changed by using the Hand Held 5 watt VHF set, a wireless alarm which can work unto 1Km-1.2 Km. An alarm / hooter is made to hear by pressing the button in this set which alerts the workers in the sport.

The banner flag protection at level crossing is another system arranged by West Central Railway. A locking arrangement for lifting barrier is linked thro' crank and rodding arrangement. This helps in rotating the banner flag frame fixed on rod provided with bearing. The gateman operates it to ensure safety for all.

RAIL COACH FACTORY IN KAPURTHALA, PUNJAB

This is a prestigious unit of the Indian Railways. It is in Kapurthala in Punjab state over 137 hectares. Around 20 hectares of land is used for covered workshop. More than 7000 employees are engaged in producing air conditioned, non- A/c and self propelled coaches for Broad guage and meterguage rail tracks. It is proud to say that they manufacture 1500 coaches / year and so far they have brought out 16000 rail coach of 51 varieties.

Under a TOT contract with Alstom – LHB Germany Rail coach factory has rolled out Alstom – LHB designed coaches for Rajdhani and Shatbadi trains.

The high speed coaches manufactured by it have stainless steel, lower coach weight, max operating speed up to 180 Kmph, disc brakes for efficient braking and lesser maintenance, wheel slide protection, better curve negotiation due to articulated control arm fitted with resilient brush, FIAT bogie, modular toilets, wider vestibules, centre buffer coupler, fire retarding furnishing, 4 emergency exit etc.

All coaches are designed using CAD / CAM technology. The Shatbadi Express running between Amritsar and New Delhi has all modern comforts strength and are of high speedy IRY coaches It has achieved ISO 9001 and ISO 14001 certificate for quality management system and Environmental management system.

In all respects the Indian Railways have taken steps to widen its scope in serving the public.

LC Gate Control Equipment using Wired and Wireless Data Communication for Communication Between ASM Office & LC Gates

Railway’s existing system is based upon Magneto Phones, connected through underground / overhead quad lines between Station Master’s Office and LC Gates. These lines often go defective due to short circuit, breaks, theft and many other reasons. Besides this, Voice Communication engages Station Manager for much longer duration at the time when he is required most to interact with others for safe train movement.

Options
At many places instead of Magneto Phones, Wireless has been used on adhoc basis without RASO evaluation. But wireless has its own problem and hence wireless system by itself is not entirely satisfactory system.

The Level Crossing Gate Communication System

- The communication between manned level crossing gates and ASM is very vital for smooth traffic movement at level crossing.
- The developed equipment enhances the safety to train movement by ensuing 24 hrs round the clock working. vital for smooth traffic movement at level crossing.
- The System consists of Micro Controller based Control Equipments at Station Manager Office and Gate Equipment as Level Crossing Gates.

Development

Equipment was developed by joint efforts of Three Directorates of RDSO – Lucknow and AE Telelink Systems Ltd., New Delhi.

- Telecom Directorate
- Traffic Directorate
- Track Design Directorate

Equipment was designed in accordance with and as per

Safety Guidelines mentioned in Railway Boards Safety Circular No.2000/Safety (AR)/ 90/39 dated 8.5.2002.

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