

From: ICF Staff Club
AG129/18,VII Main Rd
AnnaNagar,Chennai-40

To



INTEGRAL NEWSST

Issue# 122

Free Monthly News Bulletin – for Internal Circulation

December 2015

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TTC: J.Selvakumar,SSE/TTC

D&D: Sabapathinathan.M,SSE/D&D

Hospital: Raju Balaji, Ch.OS

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74,Tele,Union: D.N.Ramesh,SSE/Proj

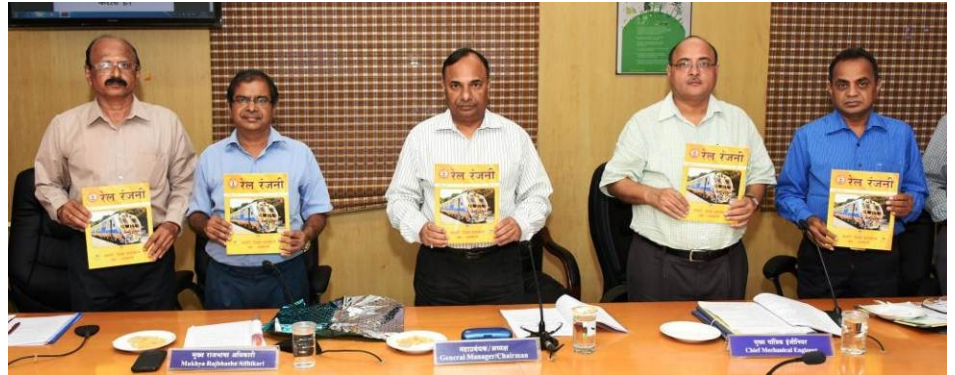
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GM releasing 'Rail Ranjani' magazine at the valedictory function of Rajbhasha Utsav



Shri Ashok K Agarwal, GM, has appreciated the staff of Personnel, Engineering and Electrical departments for their efficient work during the rain in Nov'2015 in which the factories and colonies were badly affected.



Shri Ashok K Agarwal, GM, giving away the prizes to the winners of Rajbhasha Exhibition-2015.



Newly modified CME's office was inaugurated by Shri L.C.Trivedi, CME, on 27th Nov 2015.



ICF volleyball team has won the 61st All India Railway volleyball championship held at Secunderabad from 17th to 24th Nov '15. This is for the second year in succession.

OFFICIAL POSTINGS

Name S/Shri/ Smt	Previous	Present
Arun Kumar	Leave	CEGE
Debi Prasad Dash	CEGE	CEE/QC&C
S.Sridhar	CEE/QC&C	Leave
K.Ezhilarasu	AEE/MPO/F	AEE/MRVC/
I.Thirumalai Ramanan	SSE/85	AEE/MPO/F

EMPLOYEES RETIRING on 31st December '15

1	Perumal.S	JE/CSU	14
2	Sundaragovindarajan.S	SrTech/Weld	15
3	Yeswanthraj Ambethkar.V	SrTech/Weld	21
4	Desmond La Porte.	SrTech/Weld	23
5	Padman.S	SrTECH/FGL	26
6	Pandari.R	C&MS	CMT/S
7	Vincent.A	SrTech/MDM	CWE/S Off
8	Pushparaj.S	Tech-1/MDM	GM's Off
9	Jayakumar.B	JE/CSU	30
10	Venugopala Pillai.N	SrTech/Carp	30
11	Ramamoorthy.S	SrTech/Carp	30
12	Audishesan.K	SrTech/Carp	32
13	Sathyannarayanan.R	SrTech/Weld	37

We wish them A Happy & Peaceful Retired Life

Winners of Energy Conservation Contest

Best Slogan J.Diana Jr Clerk/PB	Best Innovation S.Hameedudeen SSE/Shop-19	Best Poster N.Johnson Tech-2/Shop-40

Innovation:

- 1.Display of LED boards at prominent location to show
 - a.Unit of energy consumed/ day
 - b.Energy saved over previous day
 - c.Cost of energy saved
 This will create awareness about necessity of energy conservation among employees.
- 2.Procuring small compressors to operate on low load.

Best Slogan by J.Diana Jr Clerk/PB:

Be a hero, keep energy waste at zero

Slogan- II prize, K.Sandhiya, Jr Clerk/Shop-22:

சொகுசு வாழ்க்கையே மின்சார பூமி
சேமிக்காமல் போனால் மாறுமே மயான பூமி

Best Poster:



In the competitions conducted by TOLIC (Town Official Language Implementation Committee) at BSNL, RA Puram for all the government organisations, the following staff of ICF have won the prizes:-

Shri M.Subramaniam, ChS&WI: Third in Elocution

Smt Rajashree Anandan,PS: Third in Noting & drafting

Shri J.Mointaj, ChOS/CPM &

Smt R.Mangayarkarasi,OS/CWEF: Consolation in QUIZ.

Winners of Rajbhasha Exhibition-2015:

Major office group: I : Office of the CEE

II: office of the COS

III: office of the CPO

Minor office group: I: office of the SrEDPM

II: Office of the CSC

III: Office of the CMO



Sri B.Kishore, OS/Shop-36, has won the first prize in the 60th All India Railway Golf Championship held from 18th Nov to 20th Nov at Jabalpur. He has received the medal from GM/WCR.

CIRCULARS

AC18: Grant of natural calamity advance to non-gazetted railway servants affected by cyclone and floods in Tamilnadu.

Procedure order 02/2015 dt 25.11.15: allotment and maintenance of Dr Ambedkar Arangam.

Health awareness camp was conducted in all four colonies from 24 to 27th Nov.

Due to heavy rain the session on 'heartfulness meditation' scheduled to be held on 18th Nov is postponed.

Circular PB/LW/246/XIV dt 09.12.15- Grant of SCL

Inter railway cultural completion Dance – Solo & Group for employees & Family members, Last date 24.12.15.

KRCL, Project Engr, Sr/Jr TA posts LD 21.12.15

Selection for the post of ASM under GDCE by RRC, Chennai for S.Rly. LD 22.1.16

GM has appointed three committees to study damage caused due to recent flood.

All four Colonies, Hospital and Road:
DyCE, DyCPO/1, DyFA&CAO/Works& SEE/M

Shell Factory, Administrative building, TTC&AWTI:
DyCME/Prodn, DYCM/S, DyFA&CAO/S, DyCPO/1, DyCE & DyCEE/C&D

Furnishing Factory, LHB Unit, Fur Administrative building, D&D:

DyCME/F2, DyCMM/M/F, DyCPO/1, DyCE & DyCEE/C&D

Eight employees have been appointed under compassionate quota in Nov'2015

We deeply mourn the sudden demise of the following staff

1	G.Balasubramani	SrTech/Carp/TTC
2	G.Balakrishnan	SrTech/FGL/22
3	N.Kannan	Tech-1/FGL/14
4	N.Lokeswararao	Tech-1/weld/21
5	S.Loorthuswamy	Tech-1/Paint/36
6	G.K.Pandian	Tech-2/FGL/21
7	D.Sundaresan	Helper/23



The Kindergarten students of ICF Silver Jubilee Nursery and Primary School celebrated Colours Day, each section choosing a particular colour. The students and teachers dressed in that particular colour and also displayed the items of the same colour, like L.K.G four sections have chosen Red, Green, Yellow and Pink. Likewise U.K.G four sections have chosen Black with Gold, Red with White, Green with Yellow and Orange with Yellow. The tiny tots explained the importance of the colour they selected. Mrs.B.Shanthi Rammohan Reddy, Women's Organisation ICF was the Chief Guest and Mrs.T.Aruna Dilip accompanied her.



The holistic approach of the pedagogical system of education was brought out in an innovative way by celebrating "VALUE DAY" by the kids of STD I & II at ICF SILVER JUBILEE NURSERY AND PRIMARY SCHOOL on 29th Oct 2015. School's chairman Mr.D.P. Dash, CE/ICF and Dr.Avanjali Dash, research consultant were the chief guests.

values of

1. Millets
2. Wealth from waste
3. Leaders
4. Water
5. Helpers
6. India in 2030

Were the highlights of the program. The splendid array of exhibits samples, charts, models etc., stole the show.

Relief material to flood-affected Chennai can be booked in any train free of cost till 23.12.15

TTEs have been advised not to insist on ID card from passengers travelling from Chennai till 22.12.15

Snake catchers in Chennai:

Kannadasan 9442288087, Shanmugam 8608724489, Vazhmuni 9944540256, Ganesh 9843125040, Nagarajan 9364425883, Sakthivel 9047459567.



ABOUT ICF - Part III

by Sri R. Srinivasan, APE/PR/F,

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DESIGN & DEVELOPMENT : ABOUT ICF NOV-2015.

MRVC Phase-I Project

- ICF turned out the largest chunk of EMU trains during 2006-2012 under MRVC Phase-I. During this period, 130 rake sets of 3-phase AC/DC EMU trains totaling 1512 coaches have been delivered to Mumbai (Western & Central Railways).
- These trains were specifically designed to work under 25kV AC OHE as well as 1500V DC OHE, in order to allow the OHE system to change over from DC to AC system. All these trains were made from CORTEN steel body coaches having curved side wall.
- Rakes are formed by attaching 3 to 4 basic units, each basic unit in itself a self-propelled one, having a Motor coach (powering) and two/ three trailer (non-powering) coaches.
- Thus a multiple unit train has 3 to 4 motor coaches, unlike conventional trains which have a single locomotive at the driving end.
- Availability of several Motor coaches in the EMU train provides high acceleration that is what ideally required for a sub-urban service having stations at short distances. These trains start/ stop at frequent intervals, but provide faster transport.

3 Phase AC EMU (MRVC PHASE – I)

- Rake Formation - 12 cars – DTC +MC+TC+HTC + MC+TC+HTC+MC+TC+TC+MC+DTC
- D - Driving Trailer - 2
- M -Motor Coach - 4
- C - Trailer with First class -4
- DHC – Trailer with compt. for physically disabled - 2
- Max .speed 100 Km/h

Passenger Capacity

	DTC	MC	TC	HTC	Per Rake
Seating	91	86	112	99	1172
Standees	440	348	450	407	4886
Total	531	434	562	506	6058

Salient Features

- Operates on both 1500V DC and 25KV AC overhead Traction
- CORTEN Steel coach body with curved sidewall
- IGBT-based 3-phase AC electric transmission supplied by Siemens Air cooled onboard equipment
- Aerodynamic shaped steel driving end nosecone
- FRP driver desk with sleek controls and LCD display
- LED destination boards
- FRP (Polyester resin) interior paneling for side walls and SS paneling for ceiling

- Roof mounted Forced ventilation system to supply 15000 cubic m/hr fresh air to add to comfort of passengers during dense pack loading
- GPS-based Passenger Information system with LED Displays for enhanced visibility and passenger Announcement system
- Aluminum chequered sheet flooring
- Panoramic large windows with polycarbonate glass / louvers with SS safety grill
- Aluminum sliding door with nylon roller support and locks
- Polycarbonate thermoformed seats for II class ,PU cushions seats for I class
- Stainless steel Tubular frame structure on doorway and compartment partitions
- Stainless steel hand rail with SS hand holds
- Stainless steel luggage racks
- Central duct with light fitting on both sides for better illumination and aesthetics
- Stainless steel brake piping with double Ferrule Fittings
- Exterior painting scheme and signage with enhanced aesthetic standards
- Regenerative brake and EP brake .Up to 35 % Electrical Energy savings due to Regeneration
- Microprocessor based control system with built-in fault diagnostics
- Modular end wall control panels with user-friendly locks
- Availability of 100 % traction in the motor coach even in case of failure of auxiliary converter
- Bogies with air spring suspension in the secondary stage

MRVC Phase-II Project

- ICF is presently executing MRVC Phase-II project for manufacture 72 rake sets consisting of 864 coaches. First two prototype rakes (each having 12 cars) were flagged off in Oct.2013. These two trains have been subjected to rigorous trials including oscillation trials for nearly one year at the Mumbai sub-urban sections. The prototypes successfully cleared all the trials and subsequently pressed into passenger service.
- Unlike Phase-I trains, the Phase-II trains run under 25kV AC OHE only. This is because the Mumbai sub-urban system has been fully converted from 1500V DC OHE to 25kV AC OHE now, with the last DC OHE EMU rested on 8th June 2015 at Central Railway.

3 Phase AC EMU

- Rake Formation - 12 cars – D +M+C+DHC +M+C+DHC+M+C+C+M+D
- D - Driving Trailer,
- M -Motor Coach
- C - Trailer with First class
- DHC – Trailer with compt. for the physically disabled
- Max .speed 110 Km/h

Passenger Capacity

	D	M	C	DHC	Per Rake
Seating	89	86	112	99	1168
Standees	435	352	451	403	4888
Total	524	438	563	502	6056

Overall Dimensions

- Length over body - 20726 mm
- Body width - 3622 mm
- Height from RL to roof top - 3810 mm
- Bogie centre distance - 14630 mm
- Wheel base - 2896 mm
- Wheel diameter (new) - 952 mm

Salient Features

- First of its kind stainless steel EMU coach designed with straight sidewall and fluted panel for roof
- Operates on 25KV AC traction
- 3- Phase AC electric based on IGBT Technology supplied by M/ s. Bombardier water cooled equipments saves weight by 1 tonne
- Ergonomic FRP driver desk with sleek controls and LCD display
- LED destination boards
- FRP (Phenolic resin) interior paneling with concealed screws (Aluminum composite panels provided for prototype rakes)
- Aerodynamic profile of driving end for better aesthetics and energy conservation
- Roof mounted Forced ventilation system to supply 16000 cubic m/hr fresh air to add to comfort of passengers during dense pack loading
- GPS-based Passenger Information system with Double side LED Displays for enhanced visibility and passenger Announcement system
- SS slip-free finish flooring
- Panoramic large windows with polycarbonate glass / louvers with SS safety grill
- Aluminum sliding door with maintenance free roller guide rails and rugged user friendly lock / latches
- Polycarbonate injection moulded seats for II class ,PU cushions seats for I class
- Stainless steel Tubular frame structure with Honey comb panels on doorway and compartment partitions
- Stainless steel hand rail with SS hand holds .(Polycarbonate twin handles on SS ball -and -socket joint provided in prototype rakes)
- Stainless steel luggage racks with user -friendly profile
- Central duct with light fittings on both sides for better illumination and aesthetics
- Stainless steel brake piping with double Ferrule Fittings
- Exterior painting scheme and signage with enhanced aesthetic standards

- Regenerative brake and EP brake .Up to 35 % Electrical Energy savings due to Regeneration
- Microprocessor based control system with built-in fault diagnostics
- Modular end wall control panels with user-friendly locks
- Inclusion of ADD (Automatic drop device) and ORD (Overreach detection) in pantograph to prevent damage to OHE and pantograph in case of unusals
- Downloading of diagnostic data of TCMS through MCG (Mobile Communication Gateway)
- Availability of 100% traction in the motor coach even in case of failure of auxiliary converter
- Redundancy of train control through MVB (Multifunction Vehicle Bus) and IP (Internet protocol)
- Provision of Air spring failure indication in Driver's desk display
- Provision of LED based cab spot light , Emergency light and step light for ladder
- 110V DC operated Electrical wiper System to improve reliability
- Bogies with air spring suspension in the secondary stage.

3 PHASE AC EMU (Indigenous Electrics)

- 3- Phase AC electrics based on IGBT Technology developed indigenously and supplied by M/s Medha. Air-cooled onboard equipment.

3 - PHASE AC EMU (Air-conditioned)

- Rake Formation - 12 cars DMC1 +TC1+TC2+TC2 +TC1+NDMC1+NDMC2+TC3+TC4+TC4+TC3+DMC2

DMC - Driving Motor Coach

NDMC - Non Driving Motor Coach

TC - Trailer Coach

DHC - Trailer with compt.for the physically disabled

Salient Features

- Stainless steel body coach designed with straight sidewalls
- Airtight gangways (vestibules) in all trailer coaches and through vestibuling available for 6 coaches each
- 2 x 15 ton capacity roof mounted package units (RMPU) for air conditioning in each motor coach drive the RMPUs
- Roof AC ducts are insulated and provided with streamlined diffuser grills
- Separate AC unit for driver cab
- Stainless steel aerodynamic nose cone at driving end
- Electrically operated automatic sliding doors. Motor coaches have 2- doors aside while trailer coaches have 4- doors aside with manual override for emergency
- Passenger talk back facility at each doorway for emergency
- Operates on 25KV AC traction
- IGBT-based 3-Phase AC electric transmission supplied by BHEL .Air cooled onboard equipment
- FRP driver desk with sleek controls and LCD display

- LED destination boards
- 3- seater injection moulded polycarbonate seats in all the coaches
- Polycarbonate twin handles on SS ball- and –socket joint for hand holding
- Aluminum extruded modular luggage racks with polycarbonate transparent glass at bottom
- Wide and large double-sealed glass windows for panoramic view
- Wear-resistant PVC floor top with Aluminum honeycomb sub –floor
- Aluminum composite panels for interior paneling with concealed screws and extrusions at joints
- GPS based LED Displays for passenger information and announcement system
- Stainless steel brake piping with double Ferrule Fittings
- Exterior painting scheme and signage with enhanced aesthetic standards
- Regenerative brake and EP brake .Up to 35 % Electrical Energy savings due to Regeneration
- Microprocessor based control system with built-in fault diagnostics
- Modular end wall control panels with user-friendly locks
- Provision of Air spring failure indication in HMI on the Driver's desk display
- Provision of LED based cab spot light , Emergency light and step light for ladder
- 110V DC operated Electrical wiper System to improve reliability
- Bogies with air spring suspension in the secondary stage.

To be continued

In a judgement, the CAT's Ahmedabad bench on Monday quashed the Railways' scheme that entailed granting jobs to wards of retiring employees, especially drivers and gangmen, when they are declared medically unfit at the time of their retirement.

IRCTC has introduced e-bedroll facility that allows passengers to order takeaway bedroll kit online and also at the counters of food plazas at stations. Passengers can avail this facility by paying Rs 140 for two bed sheets and a pillow and Rs 110 for a blanket.

Assured off Take Agreements (AOT) signed on 24th Nov, for SAIL-RITES Bengal Wagon Industry Pvt. Ltd. (SRBWIPL) for manufacture & rehabilitation of wagons at Kulti, West Bengal, for production of stainless steel wagons. This factory will commence its production very soon. It is a Joint Venture (50%:50%) between SAIL and RITES. Assured off take by IR – 1200 modern high speed stainless steel wagons per annum, High end sophisticated hydraulically controlled jigs & fixtures for manufacture of underframe, side body & end body of wagons, CNC under water plasma cutting machine for precision profile cutting of stainless steel plates, Unique Rail-cum-Road vehicle for simultaneous shunting of wagons on rail and movement on road.

The Railway authorities have decided to allot handicapped quota of two berths in sleeper class [lower and middle] for physically handicapped persons travelling on concession. From 22nd Dec, whenever a PH person books ticket, if no berth is available in handicapped quota; the system will automatically try to allot the lower berth to him/her and middle berth to escort, subject to availability of same at the time of booking.

Parents who used to travel paying half the adult fare for accompanying children in reserved classes would have to pay full adult fare from April 1, 2016. However, the 50% concession for children between 5 and 12 years in unreserved class of journey will continue. If berth/ seat is not sought for the children at the time of reservation, then half of adult fare shall continue to be charged.

Trial run of the first model rake of 'Make in India' railway coaches was successfully conducted between Bhopal and Bina railway stations at a speed of 120 kmph, designed by Bhopal's coach rehabilitation workshop (CRWS), Nishatpura. Spacious seats, wider side berths equipped with jerk-less springs, Multi mobile charging points and LED reading lights, The coaches have snacks table, There will be fire extinguishers on both sides of a coach, Floor of the coach has been painted like a carpet., Bio toilet systems have been installed in all coaches with soap case and dustbin, Middle berths have side support and railing instead of chains, This new model rake of coaches will first be introduced in ISO certified trains and Rajdhani Expresses.

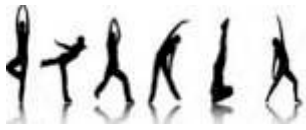
Railways have increased the minimum chargeable fare from Rs.5 to Rs.10 from 20/11/2015 to make it at par with the Platform ticket charges. To begin with this will be applicable only to Second class Non-suburban services

Indian Railways travellers can now make payments for their tickets using MobiKwik as it is now the first payment option on IRCTC Connect Android App.

It is learnt from the newspaper reports that the Railway Board has proposed that Railways should be run only by engineers and technocrats, with no place for non-engineers or civil servants at the top. At present, the Railways management comprises five engineering services and three civil services cadres. The board now wants to induct all the services through the Engineering Services Exam (ESE) — thereby making it impossible for non-engineers to qualify for an officer's post.

To protest against the move, the civil services cadres — IRTS, IRPS, IRAS — along with the Railway Protection Force (RPF) seems to have formed the Indian Railway Civil Services Officers Association (IRCSOA), breaking away from the Federation of Railway Officers' Association, which was the only platform for all Group A officers in Railways so far.

A 24x7 free emergency medical Centre has been inaugurated at the Chennai Central railway station, adjacent to the main entrance, next to the SM's cabin, on 5.11.15 to provide immediate medical aid to passengers.



MOVE... TO REMOVE...!

Physio.Kumaravel.M,

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BACK EDUCATION

FAQs from Readers and Patients



Posture correction exercises for scoliosis Continues..

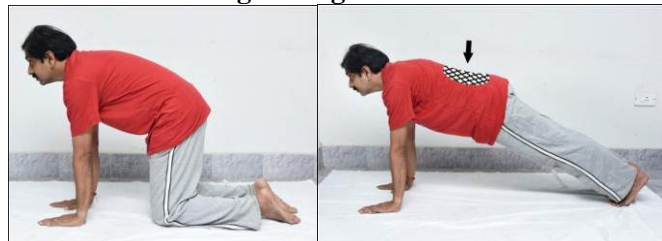
Hip muscle stretching exercise:

	<p>Steps:</p> <ul style="list-style-type: none"> ✓ Bend right leg and place the foot on outer aspect of the knee of the other leg. ✓ Hold the bent knee and try to push towards the floor as much as possible and feel stretch in the outer side of hip. ✓ Stay for comfortable counts 5-10 -15. ✓ Bring back and repeat after a little gap. ✓ Number of repetitions 3-5 times.
<p>Starting position: Lie down in supine (face up) position.</p>	

Butt muscle strengthening Exercise :

	<p>Steps:</p> <ul style="list-style-type: none"> ✓ Lift the outer leg slowly, without bending the knees slightly higher than the height of your hips. ✓ Hold the position 5-10-15 counts. ✓ Lowering down, relax and repeat after brief gap. ✓ Number of repetitions 5-10 times.
<p>Starting position: Lie down on your left side with bent leg slightly; place your hand behind your head.</p>	

Back muscle strengthening exercise:



Starting position:
Kneel down and stand on all fours limbs as a table (see the picture 1).

- Steps:
- ✓ Straighten the knees and drop the buttocks until the body is straight.
 - ✓ Maintain the Straight arm.
 - ✓ Hold the position comfortable duration 5-10 counts.
 - ✓ Repeat the procedure 5 -10 times.

Advanced corrective exercise for scoliosis:



Starting position:

Lie on right side comfortably.

- Steps:
- ✓ Raise and rest the head in the right palm as in the picture supporting them on right elbow.
 - ✓ Raise the left leg as high as possible and slide the left hand and grasp the big toe.
 - ✓ Hold for comfortable counts (5-7-10) without straining.
 - ✓ Return to the relaxed position.
 - ✓ Repeat the steps 3-5 times.

Note:

Prevention and control of the curve is vital in this postural deviation. Parents play an important role in the early detection. Early detection is very important for prevention. Hence simple observation technique may help more. In addition, screening programme for the children in the age group of 10 -14 years is necessary.

Once the assessment is over, appropriate therapeutic measures, either conservative or surgical, to be undertaken. The patient needs continuous education cum progressive correction exercises. Some may require spinal brace to maintain the correction.

After good correction is achieved its maintenance should be in regular exercise and avoiding certain activities and position prone to produce the existing deformities.

Q: Thank you very much for the detailed description about posture for the last 9 months. As a common man how could I know about posture deviation? Is there any self-evaluation methods ?

Thanks for your interest on self care. Learn "Self evaluation" in the New Year new issue...

	<p>Shows the region of muscle stretching</p>
	<p>Shows the region of tightening of muscle</p>

•Wait for further steps to move...

In a significant move to reduce Railways energy bill, Indian Railways started procuring 300 MW power from Ratnagiri Gas Power Ltd for its traction power needs in Maharashtra region. This is for the first time that Railways are drawing power under open access as Distribution licensees in any state. This Electric Power is cheaper by almost Rs. 4 per unit in comparison to the present tariff being paid by Railway in Maharashtra.

IR will soon set up a vocational training institute in Udupi. MR laid foundation stone for an institute for tunnel technology at Margao in Goa. This is the first of its kind in the country and second in the world.

Three Phase Technology for Traction Application

Introduction

Three phase AC drive technology has become very common and significant for modern rail vehicles. These vehicles are equipped with GTO thyristors and microprocessor control systems. Microprocessor is used for vehicle control, supervision of health and operations of all major components and diagnostics. It permits electric braking down to standstill and selection of best PWM technique for improved performance of motor as well as unity pf. The advantages associated with this technology are evident in technical as well as economic aspects.

What's need for a Change ?

Earlier, all the locomotives were using DC traction motors. The speed/torque regulation is achieved by using either tap changer on transformer or through resistance control on majority of these locomotives. Conventional relay-based protection schemes are used. In most of the cases, the driver uses his discretion to diagnose and get past the problem.

1. FRPCPY for Tap changer and its associated equipments is about 10%.
2. DC motor has inherent problems of brush gear, commutator and low power to weight ratio. DC motor is essentially a high current low voltage design which calls for expensive large diameter cables and large electro-pneumatic reverser, contactors, switches etc.
3. Thyristorised DC traction motor drives, though made the DC motor drive more efficient, suffer because of high harmonic injection into Power supply. Loss associated large filters had to be carried on locomotives to overcome this.
4. Emphasis on regeneration is increasing day by day to reduce energy bill as well as to save energy for greater national cause.
5. With ever-increasing need for hauling higher loads, there is need to make maximum use of available adhesion.
6. There is need for track friendly locomotives to reduce track maintenance efforts.

WHY THREE PHASE TECHNOLOGY?

Advantage of 3-phase induction motor over DC series motor

1. Three phase traction motors are robust and require little maintenance. Apart from bearing, it has no parts subjected to wear. It is insensitive to dust, vibration and heat.
2. No restriction on speed of motor in absence of commutators, AC traction motors can easily operate at 4000 rpm in contrast to 2500 rpm in case of DC machines.
3. The limit imposed due to bar-to-bar voltage for DC commutator motor is no more relevant with squirrel cage induction motors. Whole power flow from transformer to converter to DC link and down to inverter / motor may be chosen at higher operating voltage. Against nominal 750 V, 1000A system with

DC machines equivalent three phase propulsion is configured around 2800 V, 300A. Due to heavy reduction in operating current, power cables are much lighter and losses are reduced.

4. Power-to-weight ratio of induction motor is much higher than the DC motor. As a typical example 1500 KW per axle can be packed per Axle with induction motors compared to 800 KW maximum with DC motors.
5. Since the torque speed characteristic of the induction motor is markedly steeper than that attainable by conventional Dc machines, the induction machine can take better advantage of maximum possible tractive effort. A high mean adhesion coefficient can be expected.
6. As the adhesion coefficient is high, it is possible to transfer a part of the braking forces for the trailing load to electric brakes of locomotive. That is, in the case where regenerative braking is used, the regenerated electric energy can be increased.
7. High power/weight ratio of induction motor, reduction in cable thickness, reduction in number of contactors, switches etc. result in reduction in physical dimension and weight of the entire system.

Advantages of microprocessor - based control.

1. Almost all moving contactors, switches, relays, reversers etc. are eliminated and operation is sequenced by means of solid state logic.
2. The microprocessor is used for drive control. The microprocessor allows the redundancy to be built in controls rather than the power equipments.
3. Microprocessor-based fault diagnostic system guides driving crew about the fault location and suggests remedial action. It also keeps records of faults, which can be analysed by shed staff later.
4. Microprocessor-control software has flexibility to provide software - based solution to local operational needs.

Other advantages of three phase drive

1. The induction motor drives are about 20% energy efficient compared to DC drives.
2. Three phase drives allow regeneration and unity power factor operation. The energy saving due to regeneration and improved power factor are sizable.
3. Electric braking down to standstill is possible. It improves operational efficiency besides reduction in maintenance efforts

THEN, WHY SO LATE?

To achieve these advantages of induction motor, it is necessary to supply it with a three phase variable voltage variable frequency (VVVF) source. This could not be achieved under technically and economically feasible conditions, until the advent of GTO and microprocessor-based control system in the last few years.

Source:

<http://www.irreen.indianrailways.gov.in/uploads/files/1302581203548-Three%20phase%20Technology-291010.pdf>