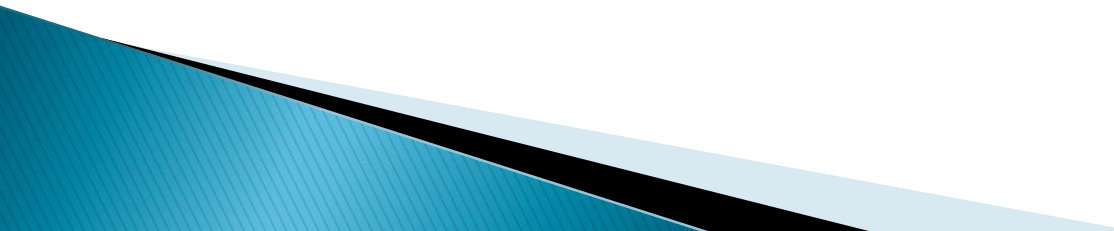


PRESENTATION

ON

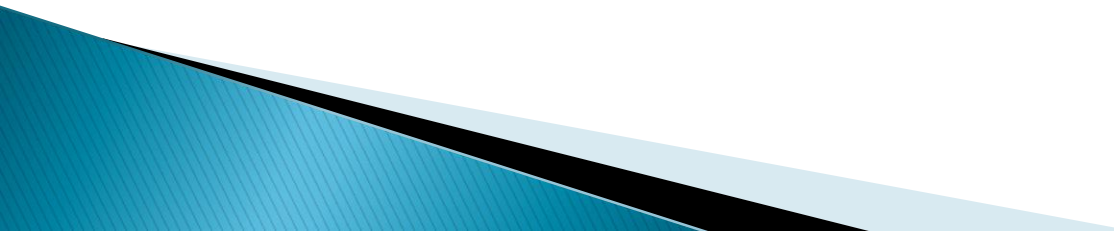
HOG OPERATION





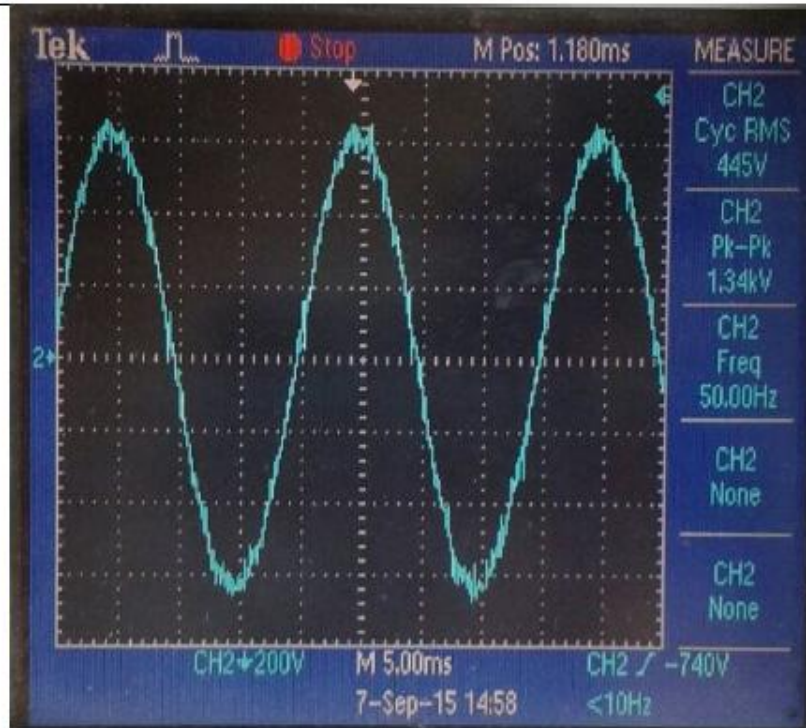
First Loco no. 30277 (WAP7) with HOG worked in Shatabdi Express (NDLS-KLK) on 21.02.2011

Development of Twin winding LOT 7775

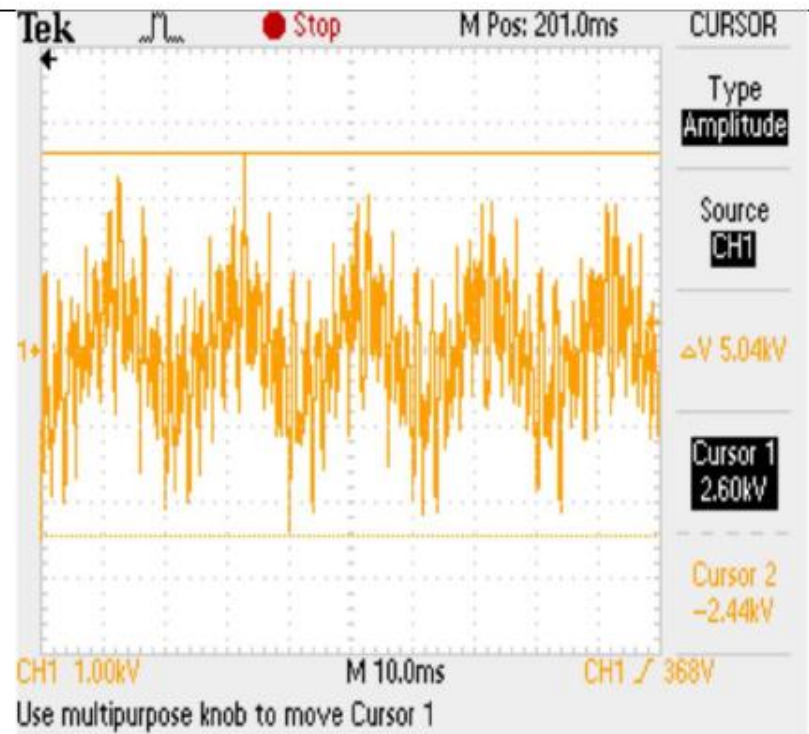
- The existing LOT-7500 has single Hotel Load winding.
 - There were problems in smooth operation of Hotel Load Converter (HLC) due to circulating current as the two HLC were connected in parallel.
 - LOT-7775 has been developed with dual hotel load winding with encouraging results.
 - Successful operation on HOG in Kalka/Chandigarh Shatabdi and further in Mumbai Rajdhani Express with dual winding transformer LOT-7775.
- 

Comparison of Voltage waveforms – Dual winding Vs Single winding transformer

L-E voltage waveform with dual winding transformer (with external RC filter)



L-E voltage waveform with single winding transformer





**HOG operation in Rajdhani Express (NDLS-BCT) flagged off
by Hon'ble MR on 30.12.2015
With loco no. 30365**

Commissioning Status of HLC in WAP-7

Make	Order Qty.	Fitted in Loco	Remarks
M/s SIEMENS	28	09	<ul style="list-style-type: none"> • Jul'10 on 30277 • Nov'13 on 30365 <i>(Presently working in Mumbai Raj. wef 30.12.2015)</i> • Jan.15 on 30406 • Dec 15 on 30445 • Jan 16 on 30446 • Feb 16 on 30454 • Mar 30457, 30453, 30455
M/s MEDHA	21	01	Feb'14 on 30375 <i>(Working in Kalka Shatabdi as well in Mumbai Rajdhani)</i>
M/s BHEL	04	01	Commissioning in progres in Loco no. 30426 for ELS/RPM. <i>Rake modification underway in SR.</i>
M/s ABB	04	00	Under prototype testing.
M/s AAL	03	00	1 no. Supplied to CLW

Position of Supply Orders

Firm	Total quantity	Qty. Supplied	Pending quantity	Comm. In Loco no.	Remarks
Siemens	1	1	Nil	30277	Order completed
	2	2	Nil	30365 30406	Order completed
	13	13	0	30445, 30446, 30453, 30454, 30455, 30457	Only Power car modification in firm's scope
	12	11	1		Power car and Coach modification in the firm's scope
Total	28	17	11	5	
Medha	7 (RB order)	2	5	30375	Coach/power car modification NOT in the scope of firm.
	1	Nil	1		Coach/power car modification NOT in the scope of firm.
	7	Nil	7		Only Power car modification in firm's scope
	6	Nil	6		Power car and Coach modification in the firm's scope
Total	21	1	20	1	

Position of Supply Orders

Firm	Total quantity	Qty Supplied	Pending quantity	Loco no.	Remarks
BHEL	4	1	3	30426	Coach/power car modification NOT in the scope of firm.
ABB	4	Nil	4		Only Power car modification in firm's scope
AAL	3	1	2		Coach/power car modification NOT in the scope of firm.

MODIFICATIONS IN POWER CARS & COACHES FOR HOG COMPLIANCE

RDSO issued modification sheet no. RDSO/PE/MS/AC/0051-2011 for modification required in Power car and EOG coaches to make them HOG compliant.

Modification to be carried out in Power Car

1. IV couplers and its dummy socket to receive electrical supply from loco to power car feeder to be provided on Non-vestibule end of power cars.

IV couplers



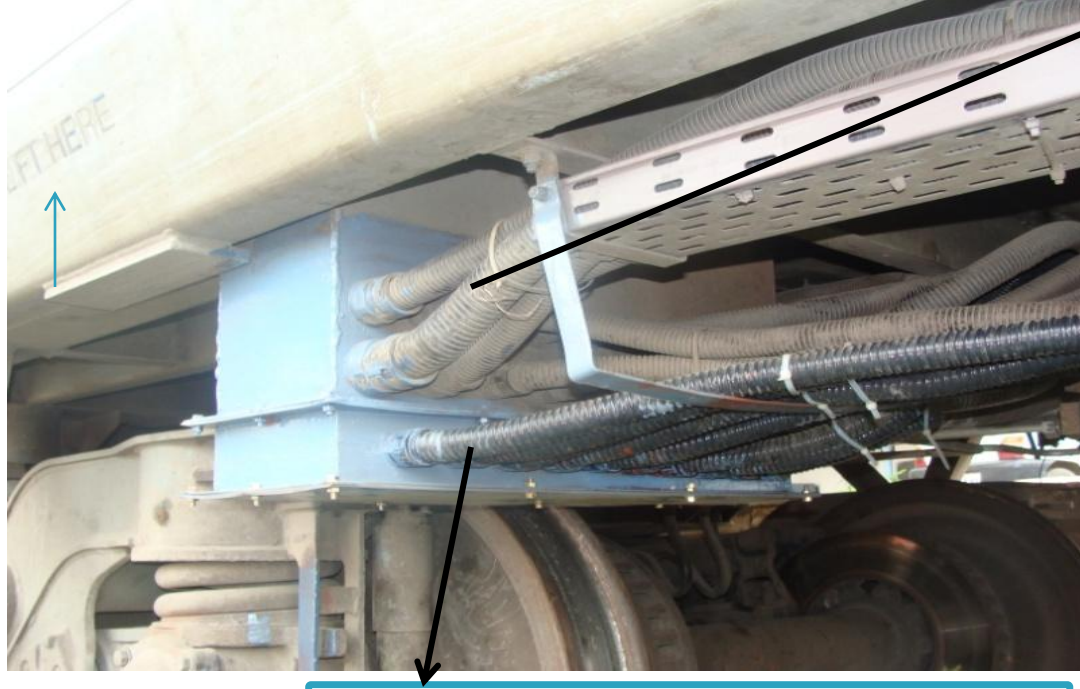
2. Provision of 02 sets of UIC Couplers for control on non-vestibule end wall for transmitting control signal from loco to power car.

UIC Coupler



Modification to be carried out in PC

3. Laying of feeder & control cable from Junction box to non-vestibule end IV coupler junction box for receiving power supply from loco:



Control cable to be laid from non-vestibule end IV coupler junction box for receiving power supply from loco.

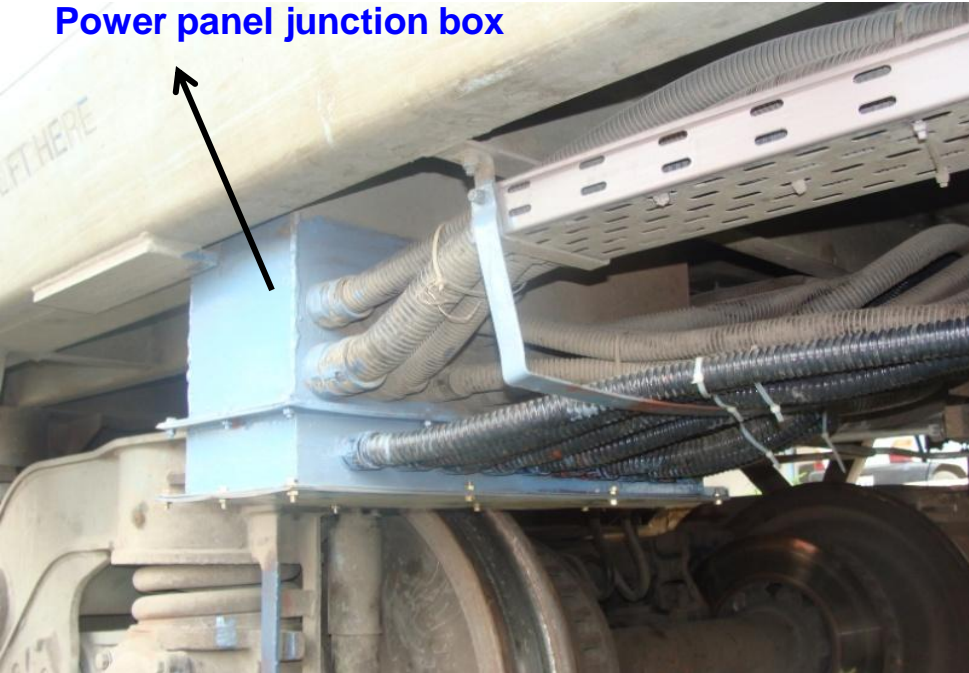
Feeder cable is already laid in existing EOG power car from FJB at non vestibule end to FJB at vestibule end and from this FJB at vestibule end to power panel junction box.

In existing EOG power cars, power cables through IV coupler are connected after feeder contactor to connect it to the incoming of feeder contactor. Now in HOG power car; Power cable of HOG converter are connected before feeder contactor so route of cable is to be modified to avoid direct supply to entire rake

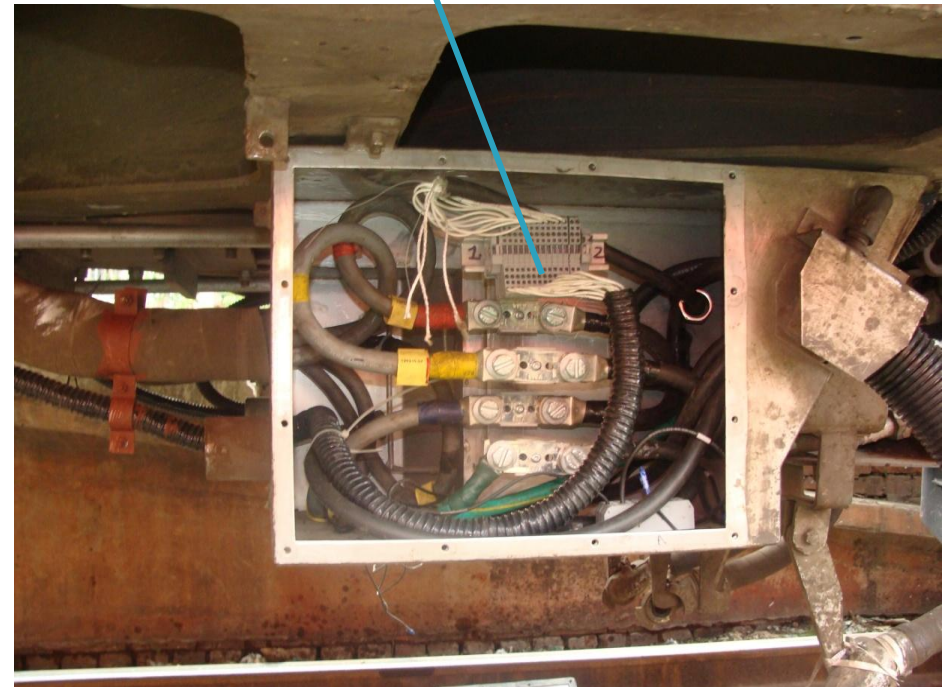
Modification to be carried out in PC

- Existing power panel Junction box under frame to be modified for feeder & control cable. 2 mm sheet of SS 304 is to be used for extending the height of Power panel Junction box from 320 mm to 410 mm. Additional connector terminals for control cable to be provided.

Power panel junction box



Additional connector terminal



Modification to be carried out in PC

5. Interlocking Control Panel to be provided and its wiring to be done with DA set and converter to achieve interlocking through this panel. It is the interface which guides technician regarding selection of source of power supply, availability of power from loco, trip status of converter and reset button of converter.



HOG Interlocking Panel is to be fitted at side wall of engine room in crew area of power car near existing power panel of power car.

Interlocking panel

600 mmx300 mmx200mm

Modification to be carried out in PC

6. Since feeder contactor coil supply is given from phase and neutral of 750V AC DG set supply in existing system and neutral wire is not present in HOG converter hence

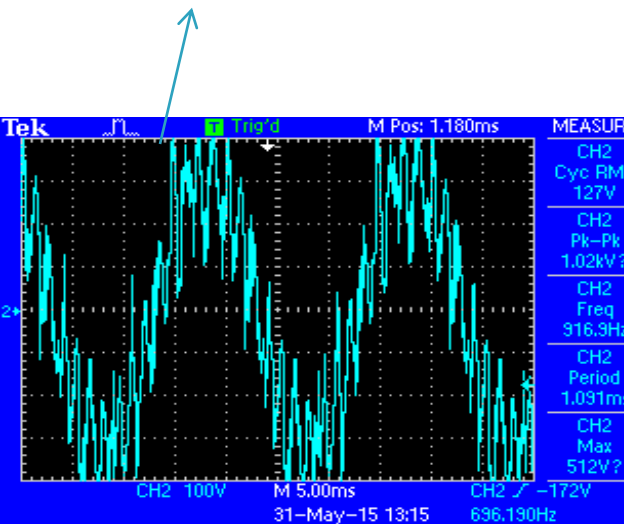
10 nos 3-phase 100 VA, 750/415 Volt Transformers are to be provided with fuse in power car as under

- One transformer is to be provided in each feeder (K1 and K3 contactor) and two nos. transformers are to be provided in bus coupler K2 contactor.
- 4 nos. of such transformers to be provided for energizing the contactors for Power Car.
- Another 2 nos. of such transformers to be provided in SB cabinet of RMPU for feeder selection contactors.

Modification to be carried out in Power Car

Two nos. of **RC filters** to be provided in the switch board cabinet of the power car. One RC filter to be provided between phase and neutral and other RC filter to be provided between phase and earth of secondary winding of 60 kVA transformer (415V) to improved voltage waveform.

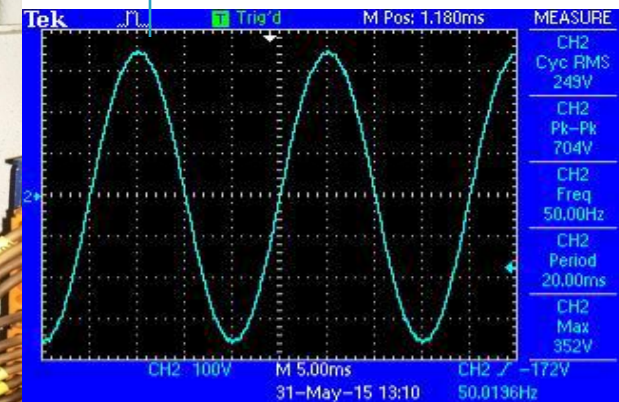
Waveform w/o RC filter



RC Filter

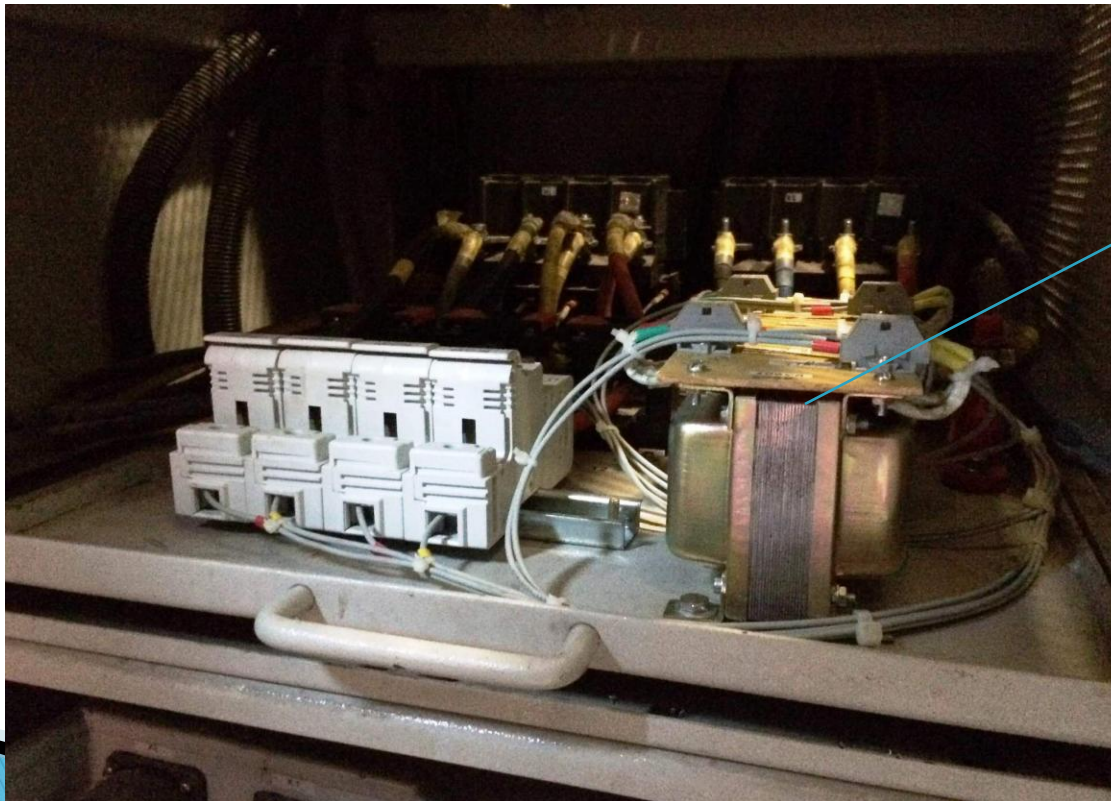


Waveform with RC filter



Modification to be carried out in coaches

- I. In existing coach 415 volt AC supply is taken from phase and neutral of feeder supply. Two nos. 3 phase 100 VA 750V/415V transformer with fuse to be provided in both the feeder contactors (K01 and K02) to provide 415 volt AC supply to power contactor coil.



**100 VA
transformer**

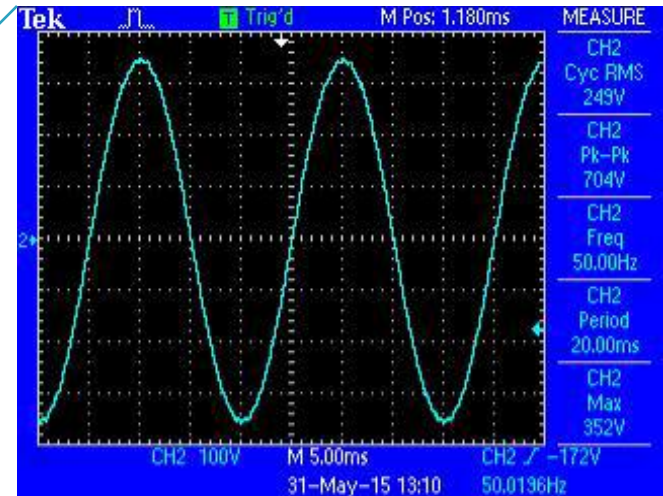
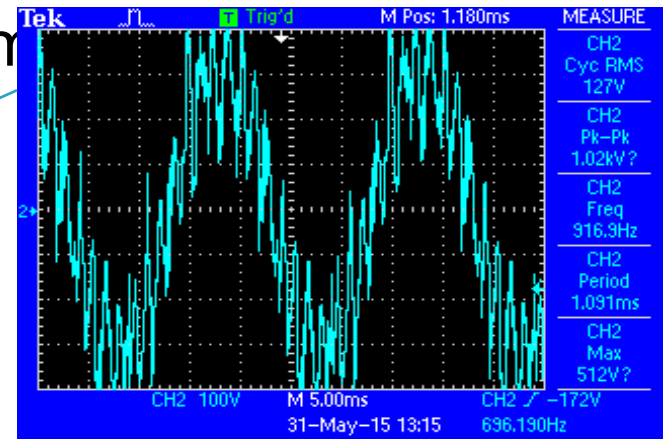
Modification to be carried out in coaches

- Two nos. of RC filter are to be provided in switch board cabinet. One RC filter to be provided between phase and neutral and other RC filter to be provided between phase and earth of secondary winding of 60 kVA transformer (415V) to improved voltage waveform



w/o
RC
filter

With
RC
filter



Modification to be carried out in coaches

3. To maintain light in the coach, lighting circuit to be changed to shift full lighting load on battery as HOG supply is not available when loco is passing through neutral section.
4. Six (06) nos. of 1A, 1.2KV HRC fuses for metering circuit and 2 nos. for 750V MMR are required to be mounted on fire retardant plate.

Action Plan for HOG operation

Action Plan as per MOM – 19.1.16

Following were decided in the meeting held on 19.01.16 at RDSO :

- ❖ *Trains were identified for HOG operation in Phase-1.*
- ❖ *Action plan for carrying out modification in power car & coaches for trains were identified for Phase-1 program.*
- ❖ *Trains were identified for HOG operation in Phase-2.*
- ❖ *Action plan for carrying out modification in power car & coaches for trains were identified for Phase-2 program.*

Trains & Rakes identified for Phase-I

SN	Train No.	Name of Train	Primary maint. depot	No of rake to be modify	Modification to be done by	No. of Locos	Loco link (shed)
1.	12951/52	Mumbai Rajdhani	BCT	5	Siemens & WR	3	ELS/GZB
2.	12953/54	AG Kranti Rajdhani	BCT			3	ELS/GZB
3.	12301/02	HWH Rajdhani	HWH	3	Siemens & ER	3	ELS/HWH
4.	12313/14	SDAH Rajdhani	SDAH	3		3	ELS/GZB
5.	12425/26	Ranchi Rajdhani	NDLS	2	Siemens & NR	2	ELS/GZB
6.	12309/10	RJPB Rajdhani	RJPB	2	Siemens & ECR	2	ELS/GZB
Total no. of rake to be modified in Phase-1 = 15							

Planning for HOG operation Phase-2

- Following trains have been identified for operation on HOG for Phase-2 after completion of Phase-I

Railway	Train No.	Train Name	From	To	Primary Maint. Depot	No. of rakes to be modified	Agency for modification
Western Railway	12909/10	Garibrath	BDTS	NZM	BCT	1	All these rakes shall be modified by Siemens.
	22209/10	Duronto	BDTS	NDLS	BCT	1	
	12227/28	Duronto	BCT	INDB	BCT	1	
	12009/10	Shatabdi	BCT	ADI	BCT	1	
	12267/68	Duronto/ICF rake	ADI	BCT	ADI	2	
	12931/32	Double Decker	ADI	BCT	ADI	1	
	12933/34	Karnavati	ADI	BCT	ADI	1	
	Total rakes to be modified						
Eastern Railway	12303/04	Poorva Express	NDLS	HWH	HWH	3	All these rakes shall be modified by Siemens.
	12381/82						
	12323/24	HWH-NDLS	NDLS	HWH	HWH	1	
	12259/60	SDAH-NDLS	SDAH	NDLS	SDAH	2	
	12019/20	RNC Shatabdi	HWH	RNC	HWH	1	
	Total rakes to be modified						

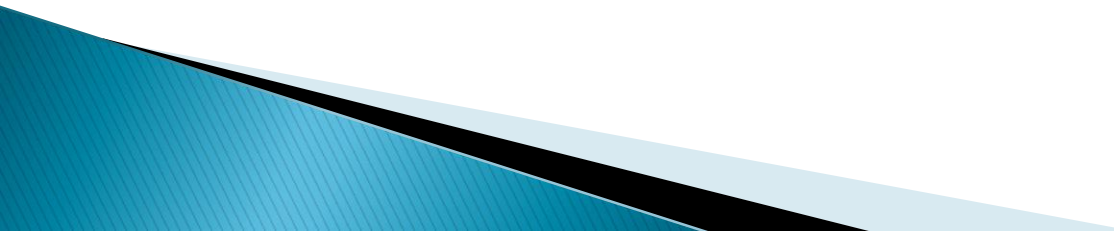
Planning for HOG operation Phase-2

Railway	Train No.	Train Name	From	To	Primary Maint. Depot	No. of rakes to be modified	Agency for modification
EC Railway	12393/94	Sampoorna Kranti	PNBE	NDLS	PNBE	2	All these rakes shall be modified by Siemens
	12397/98	Mahabodhi	Gaya	NDLS	Gaya	2	
	Total rakes to be modified					4	
N. Railway	12003/04	Lucknow Shatabdi	NDLS	LKO	NDLS	6	All these rakes shall be modified by Northern Railway
	12011/12	Kalka Shatabdi	NDLS	KLK	NDLS		
	12013/14	Amritsar Shatabdi	NDLS	ASR	NDLS		
	Total rakes to be modified					6	

Planning for HOG operation Phase-2

Railway	Train No.	Train Name	From	To	Primary Maint. Depot	No. of rakes to be modified	Agency for modification
S. Railway	12007/08	MAS-MYS Shatabdi	MAS	MYS	MAS	1	All these rakes shall be modified by Medha.
	22625/26	Double Decker	MAS	SBC	MAS	1	
	22269/70	Duronto	MAS	SBC	MAS	1	
SW Railway	12027/28	Shatabdi	MAS	SBC	SBC	1	
Total rakes to be modified						4	
Total rakes to be modified in Phase-2						29	

Planning for HOG operation Phase-2

- Rakes shall be modified as per CLW contract by M/s Siemens/Medha as per existing provision.
 - Remaining coaches/power cars of Phase-2 shall be modified by Zonal Railways.
- 

Other action decided as per MOM 19.01.16

- Railways shall provide training and counseling to the staff associated with attaching of Inter-Vehicular (IV) and UIC coupler of the power car to the loco to minimize the time taken for this activity as well as safety of train operation.
- JPO shall be issued regarding attachment/detachment of IV & UIC coupler at the Railway stations/yards by Zonal Railways as has been done by Northern Railway.
- CLW was advised to look into the feasibility of relocation of position of IV coupler for easy attachment with the power car.

Benefits
of
HOG supply system
as compared to
EOG

1. Operational fuel/energy cost saving

Table-1: Annual Saving of 101 lac will be obtained in NDLS-KLK Shatabdi Exp. (14 coaches) on energy cost basis only.

SN	Scheme	Energy cost per unit (Rs.)	Total hotel load (KW)	Total hotel load Considering duty cycle 70% of the load	Total time (Run time + pre-departure time+ Post arrival time)	Units spend in a trip of 5.0 hrs (kWH)	Total energy cost of hotel load in one trip	Total energy cost of hotel load in one round trip i.e. daily (Rs.)	Total annual energy cost of hotel load (Lacs Rs.)
1	EOG	13	636.4	445.48	5.0 hrs	2004.66	26060.58	52121.16	190.24
2	HOG	7.1	545.4	381.78	5.0 hrs	1718.01	12197.871	24395.742	89.04
Saving									101.20

Table-2: Annual Saving of 590 lac will be obtained in Mumbai Rajdhani Exp. (21 coaches) on energy cost basis only.

SN	Scheme	Energy cost per unit (Rs.)	Total hotel load (KW)	Total connected electrical load @ 0.8 diversity factor	Total time (Run time + pre-departure time+ Post arrival time)	Units spend in a trip of 17.5 hrs (kWH)	Total energy cost of hotel load in one trip	Total energy cost of hotel load in one round trip i.e. daily (Rs.)	Total annual energy cost of hotel load (Lacs Rs.)
1	EOG	13.0	886.6	709.3	17.5 hrs.	12412.4	161361	322722	1178
2	HOG	7.1	806.6	645.3	17.5 hrs.	11292.4	80515	161030	588
Saving									590

2. Additional earning due to replacing PC to passenger coaches

- In regular practice, 2 nos. of power car equipped with EOG. With HOG, there is need of only one power car for standby purpose.

Train	Coach type	No. of seat	Fare/seat (Rs)	Earning in one trip (Rs)	Earning in round trip (In Rs.)	Annual (365 days) earning (in Lakh Rs.)
Kalka Shatabdi	Executive Car	56	1260	70560	141120	515.09
	Chair Car	78	595	46410	92820	338.79
Mumbai Rajdhani	Second AC	46	2865	131790	263580	962.07
	Third AC	64	2080	133120	266240	971.78

- By replacing one Power Car by a passenger coaches, additional earning of revenue of minimum **339 Lac** and **962 Lac** will be obtained in Shatabdi and Rajdhani Express respectively.

3. Pollution free

- No burning of Diesel means free from Air Pollution
- No use of DA sets means free from Noise Pollutions.

4. Better reliability

- By reduced number of generating equipments;
- Low maintenance requirement ;
- Reduced dead weight as compared to SG and EOG system.

Thanks