BRIEF HISTORY OF NORTHERN RAILWAY, DIESEL SHED, TUGHLAKABAD

A. BRIEF HISTORY

Photo of Shed





Loco of shed in colour scheme









Colour scheme of TKD based locos.

1). **WDP1 type locomotives-**
French blue in lower and upper portion of Hood + Front and Back portion of engine+ White painting in the middle+ Lining with French blue in the white middle portion+ Bogie with black paint + Cabin with Satin blue.

2). **WDP2/WDP3A type locomotives:**
Same colour scheme as in WDP1 locomotives.

3). **WDP4/ WDP4B type locomotives**
Same colour scheme as in WDP1 locomotives.

4). **WDM2/WDM3A type locomotives-**
Cherry Red in lower and upper portion of Hood and same paint in front and back portion of engine+ White paint in the middle portion+ Lining with cherry red in the middle white portion+ Bogie with black paint+ Cabin with Satin blue.

5). **Rebuilded locos WDM3A type**
Orange paint on hood, front & back portion of engine+ Lining with silver paint+ bogie frame with black paint.

1. Year of Establishment : Diesel Shed, Tuglakabad was established in the year 1970 with a planned holding of 80 locomotives and initial holding of 26 WDM_2 locomotives**.**

2. Road No./Type of the first loco homed in shed : WDM2 (Loco No. 17124)

Sl.	Loco No.	Loco Type	DOC	Sl.	Loco No.	Loco Type	DOC	Sl.	Loco No.	Loco Type	DOC
1	11173	WDM3D	01.06.07	51	15038	WDP1	01.01.98	101	16302	WDM3A	02.07.91
2	11177	WDM3D	01.07.07	52	15039	WDP1	01.01.98	102	16303	WDM3A	01.08.91
3	11189	WDM3D	01.12.07	53	15040	WDP1	01.01.98	103	16305	WDM3A	01.08.91
4	11218	WDM3D	01.01.08	54	15041	WDP1	01.01.98	104	16308	WDM3A	01.08.91
5	11219	WDM3D	01.02.08	55	15042	WDP1	01.02.98	105	16309	WDM3A	01.08.91
6	11226	WDM3D	01.03.08	56	15044	WDP1	01.02.98	106	16356	WDM3A	15.01.92
7	11249	WDM3D	01.06.08	57	15045	WDP1	01.03.98	107	16373	WDM3A	12.03.92
8	11250	WDM3D	01.07.08	58	15046	WDP1	01.03.98	108	16397	WDM3A	03.06.92
9	14004	WDM3A	01.02.95	59	15047	WDP1	01.03.98	109	16417	WDM3A	-
10	14008	WDM3A	01.04.95	60	15048	WDP1	01.04.98	110	16489	WDM2	01.06.93
11	14015	WDM3A	01.06.95	61	15050	WDP1	01.05.98	111	16491	WDM2	01.06.093
12	14018	WDM3A	01.07.95	62	15051	WDP1	01.07.98	112	16605	WDM2	01.04.95
13	14135	WDM3A	07.08.02	63	15052	WDP1	01.08.98	113	16611	WDM2	01.08.94
14	14136	WDM3A	07.08.02	64	15053	WDP1	01.09.98	114	16636	WDM2	01.10.94
15	14729	WDG3A	03.03.99	65	15055	WDP1	01.12.98	115	16665	WDM2	23.12.94
16	14800	WDG3A	01.10.99	66	15506	WDP3A	01.02.00	116	16765	WDM2	14.11.96
17	14806	WDG3A	01.11.99	67	15507	WDP3A	01.02.00	117	17532	WDM2	01.09.75
18	14832	WDG3A	03.02.00	68	15508	WDP3A	01.03.00	118	17565	WDM2	13.02.76
19	14848	WDG3A	01.04.00	69	15509	WDP3A	01.03.00	119	17655	WDM2	20.06.77
20	15001	WDP1	01.05.96	70	15510	WDP3A	01.04.00	120	17658	WDM2	07.04.77
21	15002	WDP1	01.04.96	71	15511	WDP3A	04.05.00	121	17666	WDM2	16.06.77
22	15003	WDP1	01.05.96	72	15512	WDP3A	01.04.00	122	17680	WDM2	13.08.77
23	15004	WDP1	01.04.96	73	15513	WDP3A	04.05.00	123	17708	WDM2	10.12.78
24	15005	WDP1	01.04.96	74	15514	WDP3A	01.04.00	124	17719	WDM2	25.01.78
25	15006	WDP1	01.04.96	75	15520	WDP3A	01.08.00	125	17901	WDM2	12.01.80
26	15007	WDP1	01.04.96	76	15521	WDP3A	01.08.00	126	17903	WDM2	22.01.80
27	15008	WDP1	01.04.96	77	15523	WDP3A	01.09.00	127	17907	WDM3A	28.03.80
28	15009	WDP1	02.09.96	78	15525	WDP3A	01.10.00	128	17921	WDM3A	20.04.80
29	15010	WDP1	01.04.96	79	15526	WDP3A	01.10.00	129	18471	WDM3A	13.04.84
30	15011	WDP1	01.04.96	80	15527	WDP3A	01.10.00	130	18542	WDM3A	01.05.81
31	15012	WDP1	01.04.96	81	15528	WDP3A	01.12.00	131	18589	WDM2	01.08.82
32	15014	WDP1	04.04.96	82	15529	WDP3A	01.11.00	132	18644	WDM3A	22.02.82
33	15016	WDP1	01.05.96	83	15530	WDP3A	01.11.00	133	18666	WDM3A	11.01.83
34	15017	WDP1	01.06.96	84	15531	WDP3A	01.11.00	134	18734	WDM3A	19.10.83
35	15018	WDP1	01.07.96	85	15536	WDP3A	01.02.01	135	18751	WDM3A	15.12.83

36	15019	WDP1	01.08.96	86	15537	WDP3A	01.02.01	136	18854	WDM3A	18.11.85
37	15021	WDP1	01.09.96	87	15538	WDP3A	01.02.01	137	18866	WDM3A	10.01.83
38	15022	WDP1	01.08.96	88	15540	WDP3A	01.04.01	138	18919	WDM3A	17.08.86
39	15025	WDP1	01.11.96	89	15541	WDP3A	01.05.01	139	18931	WDM3A	01.12.86
40	15026	WDP1	01.11.96	90	15543	WDP3A	10.05.01	140	18942	WDM3A	21.03.87
41	15027	WDP1	01.11.96	91	15544	WDP3A	10.05.01	141	18948	WDM3A	11.04.87
42	15029	WDP1	01.01.97	92	16002	WDM3A	01.03.88	142	18952	WDM3A	01.07.87
43	15030	WDP1	01.02.97	93	16004	WDM3A	26.03.88	143	18953	WDM3A	01.07.87
44	15031	WDP1	01.02.97	94	16026	WDM3A	18.07.88	144	18954	WDM3A	01.07.87
45	15032	WDP1	11.08.97	95	16028	WDM3A	17.07.88	145	18984	WDM3A	01.12.87
46	15033	WDP1	11.09.97	96	16100	WDM3A	01.05.89	146	18985	WDM3A	01.12.87
47	15034	WDP1	01.10.97	97	16190	WDM3A	01.03.90	147	18988	WDM3A	01.01.88
48	15035	WDP1	01.12.97	98	16272	WDM3A	01.05.91				
49	15036	WDP1	01.12.97	99	16274	WDM3A	11.03.91				
50	15037	WDP1	01.12.97	100	16291	WDM3A	23.04.91				

3. Details of any heritage locos in Shed on pedestal or otherwise

ZB-59 Steam Locomotive



The first locomotives on the 2 feet 6 inches gauge line were the diminutive 0-4-0 type built by **Neilson & Company** in 1863. As the system grew a 0-4-2 tender engine was introduced (1891) followed by a **Kitson** 0-6-2 design (1902). From 1912 onwards a slightly heavier **Bagnall** 0-6-2 was used.

After the 1914-18 war, a list of Standard types for the 2 feet 6 inches gauge lines was issued (1925). The prefix Z indicated the gauge. All steam engines in Z category (ZA to ZF) were fitted with super heaters and 160 Lbs boiler pressure. The ZB class was 2-6-2 type having 3 feet coupled wheels and 13 M x 18M cylinders. The first ZB class steam engine was built in the year 1932 by **HAN** and was allotted to AKV (Ankaleshwar) in the Western Railway. Bulk purchase was made in year 1951-52 making it the single largest design operative on Western Railway of that time.

This locomotive ZB-59 was built by **Bagnall** in 1952 and was allocated to AKV (Ankaleshwar) in Western Railway. It was in the process of condemnation since July 1995 at Ankaleshwar. Now it has been preserved as heritage and is displayed in the Diesel Shed/TKD. The Vital statistics of this ZB-59 locomotive are given below (on next page)

Description	Parameters
Railway	W.Rly
Class	ZB
Type	2-6-2
Tender/Tank	Six wheel tender
Maker	W.G. Bagnall
Year of manufacturing	1952-53
Cylinder	305 x 450
Maximum boiler pressure in Kilograms/cm²	11.25
Total length from Buffer to Buffer in MM.	12837
Tubes (i) Smoke (ii) Flue	 65 x 44 12 x 133
Grate area in Square meters	1.30
Diameter of coupled wheels in MM.	864
Total weight including of tender in working order in Tones.	46.2
Mean tractive force at 85% Boiler pressure in Kg.	5402

4. **ISO Certification Year**

9001	:	ISO-9001:2000 certification from ISO certification body Florida, U.S.A through Quality Services International/Jaipur July, 2003, as per the required Quality Standards
14001	:	ISO-14001 certification on 13.10.03 through Indian Register Quality Systems.
18001	:	OHSAS-18001compliant by M/s. Kvalitet Veritas Quality Assurance on 30 May'06.

5. **Type-wise holding : WDM2-18 WDM3A-44 WDM3D-08 WDG3A-05 WDP1-46 WDP3A-26 WDP4-07**

6. **Maximum Holding (Year/Number of Locos)** : 2007-08 (Avg-164.25 locos)

7. Present Loco Link : 128

8. **Homing Capacity** : 80 Locos

9. Augmentation Plans

Diesel shed Tughlakabad has following plans for the augmentation of maintenance facilities.

a. Construction of New Bogie Section associated with rooms for augmentation of facilities for maintenance of various sub assemblies of bogie and traction motor section for newly arrived WDP4 EMD diesel locos.

b. Construction of New Battery section for enhancing the capacity of battery charging facility with provision of better material handling system. This work has been completed.

c. Construction of New Car-body Cleaning Section. This work has been completed.

d. Construction of New Light Repair bay shall have 4 lines suitably designed to carry out maintenance of WDP4 EMD diesel locos with berthing capacity of additional 12 locomotives for carrying out running repairs.

e. Construction of Effluent Treatment plant to fulfill the capacity after commissioning of the requirement of treatment of effluent generation.

f. The construction of New GFO's Office/Time Office building has been augmented which was planned earlier.

g. Computer based Training Modules has been planned to enhance Quality-Training facilities for Loco pilots with some audio visual models.

h. Additional 36 rooms have been constructed for the trainee loco pilots those come on various refresher courses.

i. Additional rooms has also constructed for Visiting Lecturers from outside / Other Railway Units.

j. One additional inspection pit on Line No-2 FDB end has been commissioned and it has been planned that to be provided with fixed type of catwalks.

k. Introduction of New Generation M&P such as Computerized water load box, Computerized Coil spring testing, shock absorber testing machine, Hydraulic Torque Wrench etc. being used by the shed.

10. Other History (Not more than 4 lines) :

a) This shed is the pioneer in the field of Quality Systems in the Railways and is the first unit of Mechanical Engineering Department of Northern Railway to be certified for ISO-9002.
b) Hon'ble Minister for Railwar Sh. Nitish Kumar visited TKD Shed on 30.11.2001 and he appreciated the maintenance practices
c) The delegates of U.I.C. visited Diesel Shed, TKD on 24th March, 2007 and appreciated the work culture adopted here.

B. VITAL STATISTICS

1.	**Sanctioned Strength**	**:**	1357
2.	**On Roll Strength**	**:**	1183
3.	**No. of Officers**	**:**	07
4.	**No. of Supervisors**	**:**	126
5.	**Total Area**	**:**	1,10,000 Sq.m
6.	**Covered Area**	**:**	10,858 Sq.m
7.	**%age of Staff housed in Railway Quarters**	**:**	26%
8.	**Power Consumption**	**:**	2431830 unit/2008-09 2350674 unit/ 2009/10
9.	**Water Consumption**	**:**	718900 ltrs/days

10. <u>Educational Profile of Staff</u> :

Up to 8th	> 8th	10th Pass	10-12th	ITI	Graduate
8.38 %	13.8 %	14.0 %	12.16 %	40.10 %	11.56 %

11. Age Profile of Staff

< 30 yrs	30-40 yrs	41-50 yes.	51-55 yrs.	56-60 yrs.
11.25 %	14.88 %	31.02 %	24.60 %	18.25 %

12. MPR as circulated by E & R Dts.

Target – 5.99 as per E & R Dts.
Actual – 6.22 on holding of 157 Diesel Locomotives (included with new locomotives)

C. PERFORMANCE PARAMETERS

1. SFC/1000 GTKM

Freight	Passenger
1.99	3.67

2. **LOC/100 EKM** : 3.21

3. **Shed consumption of fuel** : Target – 700 Ltrs/Loco
Actual – 526 Ltrs/Loco (in year 2009-10)

4. **Kms. Earned by Shed Locos/month** : 1603170 (in year 2009-10)

D. ANY IMPORTANT INNOVATIONS :

Vibration Meter

Vibration Meter is a new instrument recently introduced at TKD shed for measuring vibration of the moving components on the locomotive. Measurement of Vibration gives an indication of internal health of the particular component for of critical wear and tear by generating vibration in mm/sec. By this vibration meter vibration of FIP and HP tube is measured and corrective action is taken to reduce the vibration. This will definitely reduce the failure due to breakage of Banjo bolts.



Master Controller Test Panel

Previously shed was facing the problem in testing of master controller. We use to check only the wire continuity for short segment in open and not the overall functioning of Master Controller. It use to take much more time and manpower, even then the test was not reliable and prone to failure. To overcome this problem Master Controller Test Panel has been developed in shed for testing the overhauled Master controller in short span of time and in one go. Its test is more reliable and gives the overall performance of Master Controller simulating the functioning on line. This will definitely improve the reliability of Master Controller and reduce the failure on this account to the much extent.



Conversion of GE Gov. with WW Governor system in Loco No. 15048:-

Diesel shed TKD has first time replaced the WDP1 (Loco 15048) GE Governor with Wood Ward Governor system and successfully eliminates the hunting, oil leakages problems of GE Governor.





GE Governor fitted on WDP1 Loco (Previously)

Go-No- Go gauge for wear plate measuring gap in Traction Motors:

There has been the problems of breakage of inter pole joint and Field coil joints in Traction motors.

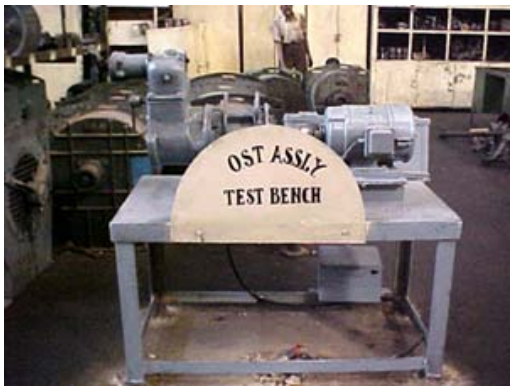
i. With the help of this gauge the gap of wear plate can be measured between bottom and top wear plate in Traction motor.
ii. It will protect the inter pole joints, Field coil joints due to reduction of vibration in Traction motor.

It can be used for all type of traction motors such 4906 AZ, 4907 AZ, 4907 BZ , 5002 AZ, 5002 BY, CGL 7362 and 7362A :-



OSTA TESTING DEVELOPED & STARTED ON 29.10.09

Over Trip Assembly Testing Bench has been developed in house. One loco's fuel pump motor has been coupled with OST assembly to check the tripping RPM. FPM gets supply through AC, which converted into D.C. Its speed is controlled through rheostats & it is helpful to control the OST assembly problem on locomotives





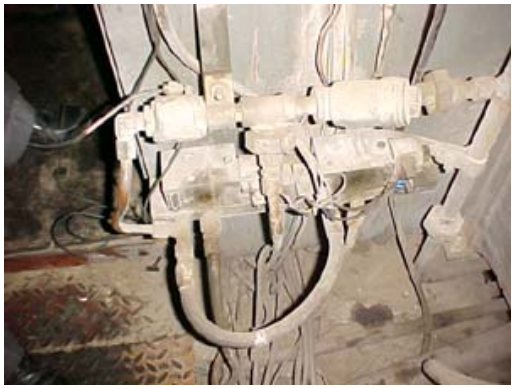
RADIATOR INTERNAL CLEANING PLANT DEVELOPED & STARTED ON 30.10.09

It has been developed in house with the help of available loco's fuel pump motor coupled with pump & run with battery supply. It will help the internal cleaning of radiator tube & in turn increase the life as well as reliability of radiators and water cooling system.



Cattle Horn Provision

Cattle horn is being provided in locomotive for avoiding cattle accident. One locomotive WDP1 No. 15048 has been provided with this device and is working properly. Further steps are in hand and material is being arranged to cover the entire locomotive.





Battery Charging Indication on Locomotive

An ampere meter made of charging & discharging indicator gauge as well as charging & discharging light is being provided on locomotive one by one so that failure on account on discharged battery would be prevented.

Air Flow Measuring Valve Calibration Stand

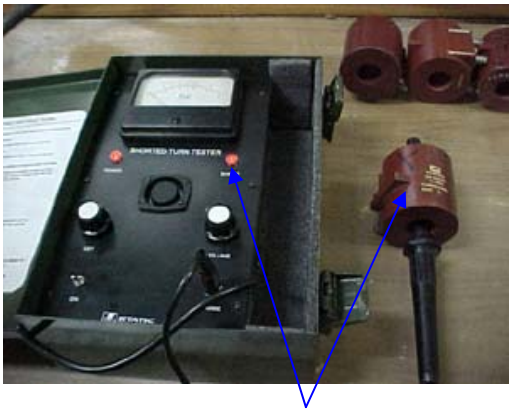
An Air flow measuring valve calibration stand has been developed by the means available in shed. This stand is used to calibrate the Air flow measuring valve (AFMV) after overhauling, in reference to the master AFMV provided on the calibration stand. This helps in minimizing the time required on the locomotive for the calibration of Air flow measuring valve and also wearing out of dummy due to calibration of AMV on loco.



Inter turn Short Circuit Tester

TKD shed has started using Inter-Turn Short Circuit Tester for contact-less and fast testing of shorted and partially shorted relay, solenoid, contactor and transformer coils which may or may not be epoxy coated. This equipment is capable of testing any type of coil without requiring any readjustment from type to type.

It overcomes the limitations of an ohmmeter which cannot detect a single shorted turn out of a total of several thousand turns in a coil. Normally, a single shorted turn in a coil of several thousand turns can only be detected if the coil-under-test is kept “ON” for a number of hours and is checked for abnormal rise in temperature. In this case, the shorted turn can be detected by merely inserting the detection probe into the coil aperture. Hence, this instrument dramatically cuts down on the testing time to a few seconds which would otherwise be a number of hours.





Inter turn short coil

Healthy Coil

Expresser Crank Shaft Bearing Extractor

Diesel Shed, TKD has fabricated one Expresser Crankshaft main ball bearing puller for extracting serviceable ball bearings in good conditions from the condemned C/Shaft as well as old unserviceable ball bearings from serviceable C/shaft without damaging any of the items. Prior to this, ball bearings were removed either by gas cutting or with the use of sledge hammers.





Handy Blow Bye Test Gadget:

Diesel Shed, TKD has made a handy “box type” blow bye test kit. It is comprised of two cut off cocks, one N-1 reducing valve, one orifice choke and two air pressure gauges to show 5.0 kg/cm^2 air pressure and resultant blow bye pressure. This blow bye Test kit is very easy to handle as it is mounted in a compact small box and can be taken easily to different locomotives for carrying out blow bye test.



Cylinder Head's Threaded Hole depth Checking Gauge:



In view of some recent cases of over hauled Cyl. Head removal from locos, a gauge has been fabricated in shed for checking depth of threaded holes in cylinder head for holding rocker arm assembly so that defective head may be rectified before fitment on loco.

Test Stand for Opening Pressure of On Line lube oil Centrifuge :

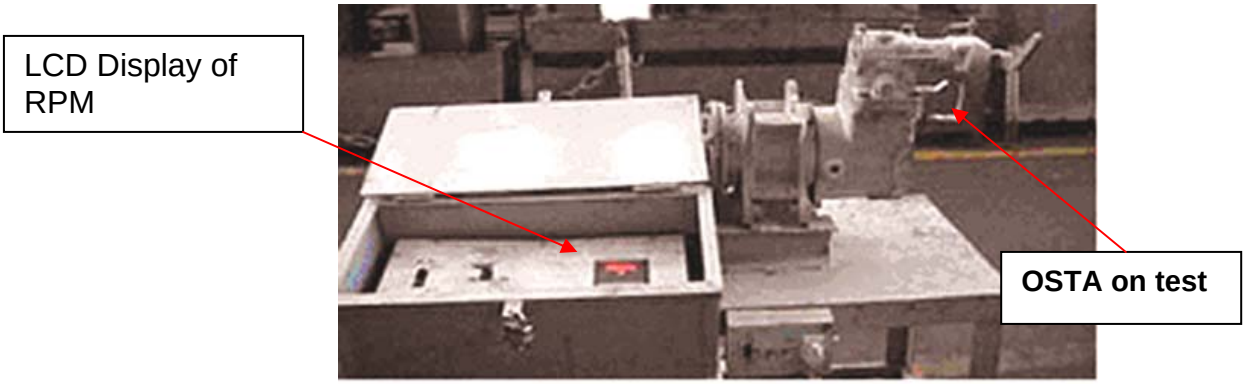




TKD shed has developed a "Test stand" for testing the opening pressure of the online lube oil centrifuge fitted in the Diesel Locomotive. This will ensure that online centrifuge does not open till adequate pressure is developed in system. This test stand shall also improve overall health of the system components such as main bearing, Con. Rod bearings, Camshafts, Valve lever mechanism, Piston & Liners etc.

Test Stand For Ascertaining Trip Speed Of Over Speed Trip Assembly OSTA)

TKD Shed had been facing problems in setting of OST assembly on locomotives. To overcome this problem, shed has fabricated a test stand on which trip speed of the OSTA is ascertained prior to fitment of the assembly on the locomotive. Whereas some sheds do have facility for checking the tripping of OSTA this test stand is unique as this gives a digital indication of the exact trip RPM. Photograph of the test stand is appended.



Shock Absorber Testing Machine:

Earlier there was no method available in the shed, by which the capacity of the shock absorbers used in loco bogies, could be ascertained in shed. When surveyed in the market, Shock absorber testing machines were found to be lying in the range of 15 to 20 lakhs. TKD shed has fabricated in-house , a shock absorber testing machine , to ascertain the capacity of used and new shock absorbers under compression ,at the designed stroke length & speed. All the components of the machine have been developed in house. The photograph of the machine is appended.



Anti Pilferage Device for Air Flow Measuring Valves:

There has been a perpetual problem of theft of air flow measuring valves as its body is made of aluminium. An anti pilferage device has been developed for WDP1 & WDM2 locos by the shed so as to deter thieves. The design allows accessibility for carrying out of proper scheduled maintenance. Photographs of this device are reproduced below. Twenty locomotives have already been provided with this device and the rest 115 will be covered in a phased manner.



Air Flow Measuring Valve



Anti Pilferage Device

RTTM Test Stand

Rear Truck Traction Motor Blower has been an area of concern due to a number of failures because of bearing seizure or belt breakage. A test stand has been developed in house by using available material for running the RTTM blower after assembly on load for a few hours so that both the bearing and the belts can be checked before the blower is fitted on the locomotive. A photograph of the test stand is reproduced below.



Air Dryer Test Stand

Air dryer s were introduced in the year 2000 for the air brake system of the diesel locomotives. The air dryers remove moisture from the compressed air supply and ensure that only clean and dry air reaches all the air brake equipments. TKD Diesel Shed has 49 locomotives fitted with air dryers. RDSO has not prescribed any performance test for the air dryer after its overhauling during schedule.

TKD Shed has developed a test bench to check the satisfactory working of the air dryer. The purging time is recorded on the test bench with the help of the digital timer and LED indicators. The air dryer is now checked for satisfactory working in the section during the schedule and defects, if any, are attended during the schedule itself.



Expressor Performance Test Notch Wise

By using two small fixtures, a gauge and an orifice of predefined size, the test stand facility for expressors is simulated on locomotive itself. This fixture is used for testing the notch wise performance of the Expressor after its overhaul and fitment on the locomotive.

Pressurized Cap Test Bench

Pressurization of cooling water system envisages a closed system in which water vapour gets accumulated. Accumulation of water vapour causes pressurization on water surface. To avoid formation of excessive pressure a spring loaded valve inbuilt in water pressure cap assembly is provided in water expansion tank in the locomotive.

The pressurize water cap assembly should precisely function at a preset pressure. The flow of air through testing cap will indicate the quantum of air leakage from the assembly seat. This will preciously monitor the pressure cap assembly opening pressure within a specified range of 0.4 Kg/cm^2 ± 0.02 Kg/cm^2 and leakage if any. Till now, there was no system to monitor the assembly before fitment on the loco.



Capacitor Leakage Current Tester

First time a test kit to check the leakage current through polar and non-polar capacitor has been installed in TKD Shed. This L.C.T. will give prior indication of arising defects in capacitors. The prior indication suggests the deterioration trend of the capacitor and reduce the failure in service.



