

# **Status of PC-9 Matrix Testing**

**Presented to HDEOCP**

**June 19, 2001**

**John L. Zalar**

# T-10

- **Planned Tests: 28**
- **Total Starts: 30**
- **Completed Tests**
  - **Verified and posted on TMC web site: 26**
  - **EOT and being reviewed/verified: 1**
  - **Aborted/Invalid: 3**
- **Tests Currently Running: 1**
- **Earliest EOT for Last Matrix Test: 6/28/01**

# M11-EGR

- **Planned Tests: 26**
- **Total Starts: 28**
- **Completed Tests**
  - **Verified and posted on TMC web site: 20**
  - **EOT and being reviewed/verified: 5**
  - **Aborted/Invalid: 2**
- **Tests Currently Running: 1**
- **Earliest EOT for Last Matrix Test: 6/20/01**

# 1R

- **Planned Tests: 18**
- **Total Starts: 9**
- **Completed Tests**
  - **Verified and posted on TMC web site: 0**
  - **EOT and being reviewed/verified: 0**
  - **Aborted/Invalid: 0**
- **Tests Currently Running: 9**
- **Earliest EOT for Last Matrix Test: 8/10/01**

# Summary of Events Required for PC-9 Licensing

J. L. Zalar 6/19/01

ID	Task Name	Start	Finish	1999				2000				2001				2002			
				Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
1	Define PC-9 Performance Parameters	3/16/99	3/16/99																
2	Design Precision Matrix	3/17/99	5/31/00																
3	PC-9 Funding MOA Signed	1/3/00	11/10/00																
4	1Q & M11EGR Adequate for Oil Devel.	5/15/00	5/15/00																
5	Finalize Base Oil Selections for Prec. Mtx.	5/31/00	5/31/00																
6	Finalize Additive Selections for Prec. Mtx.	1/6/00	6/30/00																
7	Base Oils Recd. by Additive Companies	7/3/00	9/20/00																
8	Blend Matrix Oils > TMC > Labs	9/21/00	11/27/00																
9	Final Acceptance of New Engine Tests	12/5/00	12/5/00																
10	PC-9 Matrix Testing*	6/20/01	8/10/01																
11	Precision Matrix Data Analysis (1R)	8/13/01	8/24/01																
12	HDEOCP Post Matrix Test Acceptance	7/11/01	9/5/01																
13	Subcommittee B Ballot	9/10/01	10/10/01																
14	Finalize Pass/Fail Criteria (Sub B Mtg)	10/22/01	10/31/01																
15	New Product Development	11/1/01	7/31/02																
16	API Licensing Allowed	8/1/02	8/1/02																

T-10 STATUS

<b>PC-9 MATRIX</b>																
	T-10	T-10	T-10	T-10	T-10	T-10	T-10	T-10	T-10	T-10	T-10	T-10	T-10	T-10	T-10	T-10
TEST TYPE	T-10	T-10	T-10	T-10	T-10	T-10	T-10	T-10	T-10	T-10	T-10	T-10	T-10	T-10	T-10	T-10
CMIR NO.	38814	38811	38809	38815	38953	38945	38939	38947	38954	38951	38943	38810	38937	38949	38948	38942
MATRIX LAB NO.	4	2	1	5	4	2	1	3	4	3	2	1	1	3	3	1
MATRIX STAND NO.	6	3	1	7	6	3	1	4	6	5	3	2	1	4	5	2
PC-9 OIL CODE	PC-9A	PC-9A	PC-9A	PC-9A	PC-9H	PC-9F	PC-9C	PC-9H	PC-9A	PC-9A	PC-9B	PC-9A	PC-9E	PC-9C	PC-9J	PC-9A
BASE OIL CODE	1	1	1	1	2	3	3	2	1	1	2	1	2	3	3	1
TECHNOLOGY CODE	X	X	X	X	Z	Y	X	Z	X	X	X	X	Y	X	Z	X
MATRIX RUN NO.	1	1	1	1	2	2	2	1	3	1	3	1	3	2	2	2
START DATE	27-Nov-00	11-Dec-00	6-Dec-00	15-Dec-00	2-Feb-01	2-Feb-01	20-Feb-01	28-Feb-01	2-Mar-01	8-Mar-01	15-Mar-01	23-Feb-01	16-Mar-01	2-Apr-01	4-May-01	26-Mar-01
EOT DATE	11-Dec-00	24-Dec-00	19-Dec-00	31-Dec-00	17-Feb-01	15-Feb-01	5-Mar-01	18-Mar-01	15-Mar-01	30-Mar-01	1-Apr-01	13-Mar-01	29-Mar-01	20-Apr-01	19-Apr-01	8-Apr-01
VALID	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
FAX BACK	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
ASTM NOTIFIED	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<b>RESULTS</b>																
LINER WEAR	36.3	38.0	35.1	24.4	33.3	27.0	25.3	34.0	48.2	33.0	30.9	38.0	21.2	35.1	35.4	27.4
TOP RING WEIGHT LOSS	139	139	158	349	150	69	116	156	171	125	125	168	118	133	119	87
DELTA Pb	33	12	23	11	73	21	33	115	35	37	17	19	18	77	90	16
SOOT - 75 HR	4.9	4.9	5.0	5.1	4.9	5.0	4.9	5.0	5.0	4.7	4.6	5.0	4.5	5.3	4.8	4.6
SOOT - EOT	5.7	5.5	6.0	6.6	5.2	5.3	5.4	7.1	5.8	5.9	5.1	6.0	4.8	7.6	5.7	4.8
OIL CONSUMPTION	79.00	52.10	52.30	32.20	61.00	56.00	62.85	64.01	79.60	53.29	43.90	46.49	53.35	65.95	46.93	40.53

T-10 STATUS

<b>PC-9 MATRIX</b>												
	T-10	T-10	T-10	T-10	T-10	T-10	T-10	T-10	T-10	T-10	T-10	T-10
TEST TYPE	T-10	T-10	T-10	T-10	T-10	T-10	T-10	T-10	T-10	T-10	T-10	T-10
CMIR NO.	38941	38938	38952	38957	38946	38950	38956	38944	40919	38940		
MATRIX LAB NO.	1	1	4	5	3	3	5	2	5	1		
MATRIX STAND NO.	1	2	6	7	4	5	7	3	7	2		
PC-9 OIL CODE	PC-9G	PC-9J	PC-9F	PC-9D	PC-9D	PC-9E	PC-9J	PC-9G	PC-9B	PC-9E		
BASE OIL CODE	1	3	3	1	1	2	3	1	2	2		
TECHNOLOGY CODE	Z	Z	Y	Y	Y	Y	Z	Z	X	Y		
MATRIX RUN NO.	4	3	4	2	3	3	3	4	4	4		
START DATE	9-Apr-01	20-Apr-01	7-Apr-01	15-Mar-01	1-May-01	27-Apr-01	20-Apr-01	18-Apr-01	15-May-01	15-May-01		
EOT DATE	22-Apr-01	4-May-01	19-Apr-01	3-Apr-01	17-May-01	12-May-01	9-May-01	4-May-01	29-May-01	28-May-01		
VALID	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		
FAX BACK	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		
ASTM NOTIFIED	Yes	Yes	Yes	Yes	Yes	Yes	Yes					
<b>RESULTS</b>												
LINER WEAR	29.0	31.4	26.0	45.7	33.0	28.3	29.5	39.4	23.6	20.4		
TOP RING WEIGHT LOSS	107	153	106	204	108	109	127	154	121	67		
DELTA Pb	69	44	62	25	206	52	50	27	34	22		
SOOT - 75 HR	4.8	5.0	4.9	5.3	5.5	5.4	5.3	5.0	4.6	5.0		
SOOT - EOT	5.5	6.2	5.4	6.8	8.2	6.2	6.4	5.5	5.5	5.9		
OIL CONSUMPTION	60.72	57.70	51.00	53.60	71.07	55.47	34.50	46.70	53.90	- - -		

M11 EGR STATUS

<b>PC-9 MATRIX</b>															
TEST TYPE	M11 EGR	M11 EGR	M11 EGR	M11 EGR	M11 EGR	M11 EGR	M11 EGR	M11 EGR	M11 EGR	M11 EGR	M11 EGR	M11 EGR	M11 EGR	M11 EGR	M11 EGR
CMIR NO.	38931	38932	38933	38927	38936	38967	38929	38962	38963	38930	38928	38969	38966	38934	38935
MATRIX LAB NO.	2	3	3	1	4	3	1	1	2	1	1	3	3	3	3
MATRIX STAND NO.	3	4	5	1	6	4	2	1	3	1	2	4	5	5	4
PC-9 OIL CODE	PC-9E	PC-9E	PC-9E	PC-9E	PC-9E	PC-9B	PC-9E	PC-9F	PC-9D	PC-9E	PC-9E	PC-9G	PC-9J	PC-9E	PC-9E
BASE OIL CODE	2	2	2	2	2	2	2	3	1	2	2	1	3	2	2
TECHNOLOGY CODE	Y	Y	Y	Y	Y	X	Y	Y	Y	Y	Y	Z	Z	Y	Y
MATRIX RUN NO.	1	1	1	1	1	2	2	2	2	3	1	3	2	3	4
START DATE	7-Dec-00	14-Dec-00	11-Jan-01	11-Jan-01	18-Jan-01	20-Feb-01	23-Feb-01	6-Mar-01	11-Mar-01	27-Mar-01	12-Jan-01	15-Mar-01	21-Feb-01	20-Mar-01	9-Apr-01
EOT DATE	21-Dec-00	27-Dec-00	27-Jan-01	29-Jan-01	2-Feb-01	6-Mar-01	11-Mar-01	21-Mar-01	26-Mar-01	10-Apr-01	26-Jan-01	1-Apr-01	10-Mar-01	6-Apr-01	25-Apr-01
VALID	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
FAX BACK	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
ASTM NOTIFIED	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<b>RESULTS</b>															
CROSSHEAD WEAR	23.4	51.0	28.8	20.7	42.3	23.8	22.6	15.8	16.5	18.7	17.7	13.6	27.7	19.4	19.7
OIL FILTER DELTA P (300 HR)	210	204	330	706	407	675	144	310	301	417	204	304	535	332	266
OIL FILTER DELTA P (250 HR)	- - -	127	66	178	246	308	55	171	- - -	190	111	175	265	143	97
AVERAGE SLUDGE	9.1	7.4	8.0	9.0	8.7	8.8	8.8	8.2	7.8	8.4	8.9	7.3	7.7	7.6	8.1
SOOT - 250 HR	8.2	9.1	8.0	9.1	8.5	8.2	9.0	8.8	8.7	8.7	7.9	8.2	8.2	8.2	8.1
INJ. SCREW WT. LOSS	98.9	108.4	51.2	160.5	116.6	43.7	404.0	160.9	136.1	96.6	110.2	68.2	71.8	82.1	85.0
TOP RING WEIGHT LOSS	113	172	116	104	147	125	19	197	163	148	144	125	170	139	129



M11 EGR STATUS

<b>PC-9 MATRIX</b>											
TEST TYPE	M11 EGR	M11 EGR	M11 EGR	M11 EGR	M11 EGR	M11 EGR	M11 EGR	M11 EGR	M11 EGR	M11 EGR	M11 EGR
CMIR NO.	38968	38970	38959	38961	38971						
MATRIX LAB NO.	3	3	1	1	4						
MATRIX STAND NO.	5	5	1	2	6						
PC-9 OIL CODE	PC-9A	PC-9F	PC-9A	PC-9G	PC-9D						
BASE OIL CODE	1	3	1	1	1						
TECHNOLOGY CODE	X	Y	X	Z	Y						
MATRIX RUN NO.	4	5	4	3	2						
START DATE	18-Apr-01	1-May-01	4-May-01	26-Apr-01	- - -						
EOT DATE	4-May-01	16-May-01	18-May-01	12-May-01	30-Apr-01						
VALID	Yes	Yes	Yes	Yes	Yes						
FAX BACK	Yes	Yes	Yes	Yes	Yes						
ASTM NOTIFIED	Yes	Yes	Yes	Yes	Yes						
<b>RESULTS</b>											
CROSSHEAD WEAR	28.7	23.6	11.3	19.7	38.2						
OIL FILTER DELTA P (300 HR)	532	292	345	332	294						
OIL FILTER DELTA P (250 HR)	288	186	76	160	191						
AVERAGE SLUDGE	8.9	7.0	8.9	7.4	6.9						
SOOT - 250 HR	8.0	8.1	8.8	8.8	8.6						
INJ. SCREW WT. LOSS	56.6	42.7	246.2	117.4	196.6						
TOP RING WEIGHT LOSS	145	134	176	164	145						