



ELECTRO-MOTIVE

M.I. 928

Rev. B

MAINTENANCE INSTRUCTION

LUBRICATING OIL COOLER SERVICE LIMITS

SAFETY PRECUATIONS

Please refer to the EMD Safety Precautions section in the applicable Locomotive Running Maintenance Manual or Locomotive Service Manual whenever routine service or maintenance work is to be preformed.

The Maintenance Instruction as outlined in this instruction is offered for planning purposes only. As written, this document reflects current GM EMD product design and service experience. This recommendation is consistent with present fleet performance and remains within the GM EMD experience envelope.

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1.0 INTRODUCTION

During normal operation, restrictions eventually build up within the cores of the lube oil coolers. These restrictions greatly reduce cooler efficiency; therefore, coolers should be checked periodically to verify adequate cooling capacity. This Maintenance Instruction (MI) contains testing procedures, performance baselines for oil coolers that are clean, and tables that indicate the maximum allowable deviation from the performance baselines. This MI also contains tables that relate cooler and locomotive models to the applicable performance baselines.

2.0 PROCEDURE

In order to obtain a valid indication of lube oil cooler performance, the locomotive must be operated at its full rated load and engine speed while oil and water temperatures are allowed to stabilize.

1. To obtain water inlet temperature (out of oil cooler), locate the thermometer well in the water pump discharge elbow, as shown in Figure 1, and fill it with engine oil. Place a tube-type thermometer into the well. On later locomotive models equipped with electronic sensors, readings can be taken from the locomotive computer display.

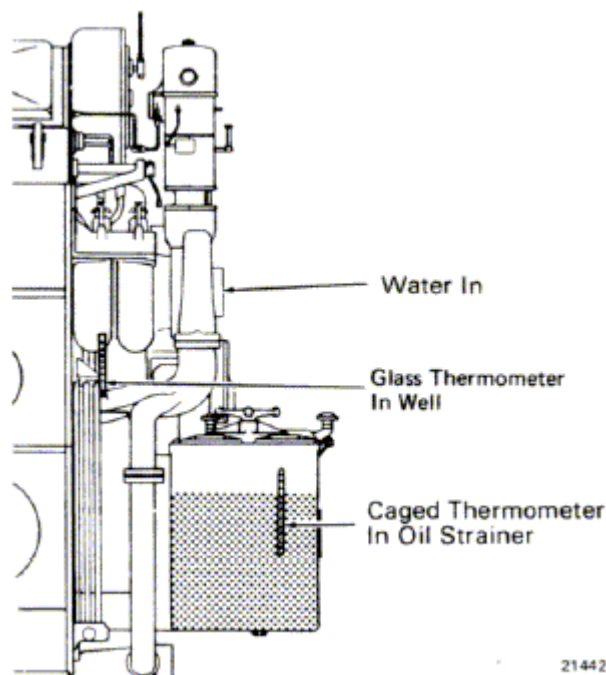


Figure 1. Thermometer Locations

2. To obtain temperature of the oil into the engine (out of oil cooler), remove the square cover from the engine mounted lube oil strainer and hang a caged thermometer bulb in the overflow compartment of the strainer housing. Ensure that the thermometer bulb is well below the surface of the oil and is kept submerged while readings are taken, as shown in Figure 1. On later locomotive models equipped with electronic sensors, readings can be taken from the locomotive computer display.
3. Set up engine loading apparatus capable of taking full rated load of the locomotive. Refer to the Load Testing section of the appropriate Locomotive Service Manual for instructions covering the load testing setup.

NOTE: Many standard load boxes are not of sufficient capacity to fully load the locomotive.

4. Operate the engine and apply load. Do not operate above throttle position No. 3 until water temperature is above 54.5° C (130° F). Operate at full load and full engine speed until engine water inlet temperature is stabilized. It may be necessary to energize or de-energize cooling fan contactors, fan clutch magnet valves, or shutter control magnet valves as applicable and needed to maintain constant engine water inlet temperature within the range of 70° C to 80° C (160° F to 175° F).

NOTE: Consecutive readings taken 15 minutes apart and showing no change in oil and water temperature indicate stable conditions.

5. Record temperature readings and compare them with the performance baseline applicable to the locomotive being tested.
 - a. Locate the specific model of the locomotive listed in the first column of the appropriate Table 1 through 3:

- Table 1 Normally Aspirated Engine Applications
- Table 2 Turbocharged Engine Applications
- Table 3 Export Locomotive Applications

A letter (or letters) given in the last column of the table identifies the performance baseline applicable to that locomotive model.

NOTE: Rebuilt Locomotives that are upgraded in horsepower (for example, an F-2 rebuilt as an F-9 at 1750 HP) are to be considered as new locomotives when referring to the above table. Present production models rebuilt as such are to be considered as new locomotives when referring to the appropriate table.

- b. Locate the applicable performance baseline on graph, as shown in Figures 2 through 11:

Figure 2	Chart Lines A, B, C, D, R, E
Figure 3	Chart Lines F, P, N, G
Figure 4	Chart Lines H, J, K, L, M
Figure 5	Chart Lines AA, BB, CC, DD, EE, FF, GG
Figure 6	Chart Lines HH, KK, MM, TT
Figure 7	Chart Lines JJ, NN, OO
Figure 8	Chart Lines PP, QQ, RR, SS
Figure 9	Chart Line LL
Figure 10	Chart Lines W, X, Y
Figure 11	Chart Line VV

On the appropriate graph, plot the point determined by intersection of the temperatures obtained in the test.

- c. From the plotted point, count the number of degrees vertically down to the applicable performance baseline. If this value is greater than the service limit given in the second column of the table applicable to the particular locomotive model, the lube oil cooler should be disassembled and cleaned, then reassembled and tested.

Table 1. Normally Aspirated Engine Applications

Locomotive Model	Service Limit		Engine Type	Loco. H. P.	Oil Cooler Assembly	Oil Cooler Core	Chart Lines
	°C	°F					
Alco-Pass.	5.5	10	16-567C	1750	8183064	8183063 or 3129515	A
SW900	5.5	10	8-567C	900	8137460	8137408 or 3125274	B
SW1200	5.5	10	12-567C	1200	8137460	8137408 or 3125274	B
RS1325	5.5	10	12-567C	1325	8137460	8137408 or 3125274	B
E9	5.5	10	12-567C (2)	2400	8137460	8137408 or 3125274	B
SD9	5.5	10	16-567C	1750	8183064	8183063 or 3129515	B
Bald. Sw.	5.5	10	8-567C	900	8137460	8137408 or 3125274	B
SW600	8.3	15	6-567C	600	8137460	8137408 or 3125274	C
E9	8.3	15	12-567C (2)	2400	8224518	8183063 or 3129515	C
F2, F3, F7, FP7	8.3	15	16-567C	1500	8080381 or 8228791 *	8228373 or 3136028	C
GP7	8.3	15	16-567B	1500	8080381 or 8228791 †	8228373 or 3136028	C
BL1, BL2	8.3	15	16-567B	1500	8080381 or 8228791 ‡	8228373 or 3136028	C
SD7	8.3	15	16-567B	1500	8183064	8183063 or 3129515	C
E8	8.3	15	12-567B (2)	2250	8137460	8137408 or 3125274	C
Alco Pass.	8.3	15	12-567C (2)	2000	8224518	8183063 or 3129515	C
Alco Frgt.	8.3	15	16-567C	1500	8183064	8183063 or 3129515	C
Alco Sw.	8.3	15	12-567C	1000	8137460	8137408 or 3125274	C
Bald. Trans.	8.3	15	12-567C (2)	2000	8137460	8137408 or 3125274	C
Bald. Sw.	8.3	15	12-567C	1000	8137460	8137408 or 3125274	C
Bald. Sw.	8.3	15	8-567C	660	8137460	8137408 or 3125274	C
Bald. Pass.	8.3	15	16-567C	1500	8220899	8220899	D

Locomotive Model	Service Limit		Engine Type	Loco. H. P.	Oil Cooler Assembly	Oil Cooler Core	Chart Lines
	°C	°F					
F.M. Frgt.	8.3	15	16-567C	1750	8225657	8225657	D
F.M. Rd. Sw.	8.3	15	16-567C	1500	8255946	8255946	D
F9, FP9, FL9	8.3	15	16-567C	1750	8259413	8228373 or 3136028	See AI 1927
GP9	8.3	15	16-567C	1750	8250727	8228373 or 3136028	See AI 1927
GP18	8.3	15	16-567D1	1800	8250727	8228373 or 3136028	E
SD18	8.3	15	16-567D1	1800	8250727	8228373 or 3136028	E
GP38	8.3	15	16-645E	2000	8364030	8228373 or 3136028	R
SD38	8.3	15	16-645E	2000	8364030	8228373 or 3136028	R
Alco Rd. Sw.	8.3	15	16-567C	1500	8250727	8228373 or 3136028	E
Bald. Rd. Sw.	8.3	15	16-567C	1500	8250727	8228373 or 3136028	E
SW1000	5.5	10	8-645E	1000	--	8225303 or 8373360	BB
SW1001	5.5	10	8-645E	1000	--	8225303 or 8373360	BB
SW1500	5.5	10	12-645E	1500	--	8365865 or 8373361	BB
MP15	5.5	10	12-645E	1500	--	8365865 or 8373361	BB
GP15-1	8.3	15	12-645E	1500		8365865 or 8373361	CC
MP15AC	8.3	15	12-645E	1500		8365865 or 8373361	CC
GP38-2	8.3	15	12-645E	2000	8461393	8228373 or 3136028	CC
SD38-2	8.3	15	12-645E	2000	8461393	8228373 or 3136028	CC
* With EDL R-915							
† With EDL R-913							
‡ With EDL R-913 or 915							

Table 2. Turbocharged Engine Applications

Locomotive Model	Service Limit		Engine Type	Loco. H. P.	Oil Cooler Assembly	Oil Cooler Core	Chart Lines
	°C	°F					
SD45	8.3	15	20-645E3	3600	8364235	8318804 or 3146250	F
DDA40X	11.1	20	16-645E3A	3300	8422327	8393169	N
SD40	11.1	20	16-645E3	3000	8364235	8318804 or 3146250	P
GP40	11.1	20	16-645E3	3000	8364235	8318804 or 3146250	P
GP39	11.1	20	12-645E3	2300	8412061	8318804 or 3146250	G
SD39	11.1	20	12-645E3	2300	8412061	8318804 or 3146250	G
GP35	11.1	20	16-567D3	2500	8272136	8318804 or 3146250	N
GP30	5.5	10	16-567D3	2250	8272136	8318804 or 3146250	G
SD24	5.5	10	16-567D3	2400	8272136	8318804 or 3146250	G
GP20	5.5	10	16-567D3	2000	8250727	8228373 or 3136028	F
GP9M	5.5	10	16-567D2	2000	8250727	8228373 or 3136028	F
GP39-2	11.1	20	16-567D2	2300	8412061	3146250 or 8318804	FF
GP40-2	11.1	20	16-645E3	3000	8412061	3146250 or 8318804	EE
SD40-2	11.1	20	16-645E3	3000	8412061	3146250 or 8318804	EE
SD40-2	11.1	20	16-645E3B	3000	8412061	9514842 or 8393169	EE
SD40-2T (Tunnel Mod)	11.1	20	16-645E3	3000	8466728	3146250 or 8318804	EE
SD40-2T (Tunnel Mod)	11.1	20	16-645E3B	3000	8466728	9514842 or 8393169	EE
GP40P-2	11.1	20	16-645E3	3000	8412061	3146250 or 8318804	EE
SDP40F	11.1	20	16-645E3	3000	8412061	3146250 or 8318804	EE
SD40-2T	11.1	20	16-645E3	3000	8466728	3146250 or 8318804	EE
F40C	8.3	15	16-645E3A	3200	8494450	3146250 or 8318804	DD

Locomotive Model	Service Limit		Engine Type	Loco. H. P.	Oil Cooler Assembly	Oil Cooler Core	Chart Lines
	°C	°F					
SD45-2	8.3	15	20-645E3	3600	8412061	3146250 or 8318804	DD
SD45T-2	8.3	15	20-645E3	3600	8466728	3146250 or 8318804	DD
F40PH	11.1	20	16-645E3	3000	8412061	8318804 or 8393169	EE
F40PH-2	11.1	20	16-645E3B	3200	8494450	8318804 or 8393169	EE
GP39X	11.1	20	12-645F3	2600	9523367	9514842	GG
GP40X	11.1	20	16-645F3	3500	8412061	8318804 or 8393169	FF
GP50	11.1	20	16-645F3	3500	9523367	9514842	FF
GP50 (Tunnel)	11.1	20	16-645F3	3500	9523367	9514842	FF
SD40X	11.1	20	16-645F3	3500	9523367	9514842	FF
SD50	11.1	20	16-645F3	3500	9523367	9514842	FF
SD50 (Tunnel)	11.1	20	16-645F3	3500	9523367	9514842	FF
SD50S	11.1	20	16-645F3	3500	9523367	9514842	FF
GP59	11.1	20	12-710G3	3000	9560308	9514842	NN (K)
F59PH	11.1	20	12-710-G3/G3A				
F59PHI	11.1	20	12-710-G3B-EC/12N-710G3B-EC	3000	10569639	9514842	MM (K)
SD60	11.1	20	16-710G3/G3A	3800	9560308	9514842	FF (K)
SD60M	11.1	20	16-710G3A	3800	9560308	9514842	FF (K)
SD60F	11.1	20	16-710G3A	3800	9560308	9514842	FF (K)
GP60	11.1	20	16-710G3/G3A	3800	9560308	9514842	FF (K)
GP60M	11.1	20	16-710G3A	3800	9560308	9514842	FF (K)
SD60I	11.1	20	16-710G3A	3800	9560308	9514842	FF (K)
SD70	11.1	20	16-710G3B / G3B-EC	4000	9560308	9514842	NN (K)
SD70I	11.1	20	16-710G3B / G3B-EC	4000	40053882	9514842	NN (K)
SD70M	11.1	20	16-710G3B / G3B-EC	4000	9560308	9514842	NN (K)
SD75I	11.1	20	16-710G3C	4300	40053882	9514842	FF (K)
SD75M	11.1	20	16-710G3C	4300	40053882	9514842	FF (K)
SD70MAC	11.1	20	16-710G3B / G3B-EC	4000	9560308	9514842	RR (K)

Locomotive Model	Service Limit		Engine Type	Loco. H. P.	Oil Cooler Assembly	Oil Cooler Core	Chart Lines
	°C	°F					
SD70IAC (Link valve open)	11.1	20	16-710G3B-ES	4000	9560308	9514842	QQ (K)
SD70IAC (Link valve closed)	11.1	20	16-710G3B-ES	4000	9560308	9514842	PP (K)
SD80MAC (Link valve closed)	11.1	20	16-710G3C-ES	5000	40054811	--	OO (K)
SD9043AC	11.1	20	20-710G3B-ES	4300	40054811	--	OO (K)
DE30AC, DE30MC	11.1	20	12N-710G3B-EC	3000	40067550	9514842	VV
SD90MAC/H ph 1 (Link valve open)	11.1	20	GM16V-265H	6000	40080869	--	HH (K)
SD90MAC/H ph 1 (Link valve closed)	11.1	20	GM16V-265H	6000	40080869	--	JJ (K)
SD90MAC/H ph 2 (Link valve open)	11.1	20	GM16V-265H	6000	40076492	--	LL (K)
SD90MAC/H ph 2 (Link valve closed)	11.1	20	GM16V-265H	6000	40076492	--	KK (K)
SD70ACe	11.1	20	16-710G3C-T2	4300	40104000 40112662		GG (K)

Table 3. Export Locomotive Applications

Locomotive Model	Service Limit		Engine Type	Loco. H. P.	Oil Cooler Assembly	Oil Cooler Core	Chart Lines
	°C	°F					
G-16	5.5	10	16-567C	1800	8183064	8183063 or 3129515	H
G-8	5.5	10	8-567C	875	6917905	8183063 or 3129515	J
G-12	5.5	10	12-567C	1310	6917905	8183063 or 3129515	J
GR-12	5.5	10	12-567C	1310	6917905	8183063 or 3129515	J
GM-6	8.3	15	6-567C	600	8225303	8225303	K
GA-8	8.3	15	8-567C	800	8225303	8225303	K
GL-8	8.3	15	8-567C	875	8225303	8225303	K
JL-8	8.3	15	8-567C	875	8225303	8225303	K
GA-12	11.1	20	12-567C	1200	8307025	8307025	L
GT-16	5.5	10	12-567D3	2400	8272136	8318804 or 3146250	M
G18	5.5	10	8-645E	1000	--	8225303	BB
GA18	5.5	10	8-645E	1000	--	8225303	BB
G22	5.5	10	12-645E	1500	--	8365865 or 8373361	BB
G22C	5.5	10	12-645E	1500	--	8365865 or 8373361	BB
SW1504	5.5	10	12-645E	1500	--	8365865 or 8373361	BB
G26C	5.5	10	16-645E	2000	--	8365864 or 8373362	AA
GT18MC	5.5	10	8-645E3	1425	--	8365865	BB
GT18MC	8.3	15	8-645E3B	1425	--	8365865	CC
GT22C	11.1	20	12-645E3	2250	8412061	3146250 or 8318804	FF
GT22CU	11.1	20	12-645E3B	2250	8412061	9514842 or 8393169	FF
GT22CW	11.1	20	12-645E3B	2250	8412061	9514842 or 8393169	FF
GT22LC	11.1	20	12-645E3B	2250	8412061	9514842 or 8393169	FF
GT26	11.1	20	16-645E3	3000	8412061	3146250 or 8318804	EE
GT26MC	11.1	20	16-645E3	2600	8454514	3146250	EE
GT26M2C	11.1	20	16-645E3	2911	8454514	3146250	EE
GT26CU-2	11.1	20	16-645E3	2700	8412061	3146250 or 8318804	EE
GT26CU-2	11.1	20	16-645E3B	2700	8412061	9514842 or	EE

Locomotive Model	Service Limit		Engine Type	Loco. H. P.	Oil Cooler Assembly	Oil Cooler Core	Chart Lines
	°C	°F					
						8393169	
GT26CW-2	11.1	20	16-645E3	3000	8412061	3146250 or 8318804	EE
GT26CW-2	11.1	20	16-645E3B	3000	8412061	9514842 or 8393169	EE
DDM45	8.3	15	20-645E3	3600	8364235	3146250 or 8318804	DD
JT22CW	8.3	15	12-645E3	2200	--	8365865 or 8373361	CC
JT22CW-2	5.5	10	12-645E3B	2250	--	8365864	BB
JT26CW-SS	11.1	20	16-645E3C	3000	9576010	9514842	SS (K)
JT42HCW	13.9	25	12-710G3B	3000	9576010	9514842	X
GT46CWM	11.1	20	16-710G3A	3800	9560308	9514842	Y (K)
JT42CWR	11.1	20	12N-710G3B-EC	3000	9576010	9514842	X
JT42HW-HS	11.1	20	12N-710G3B-EC	3000	40067550	9514842	TT (K)
GT46MAC, GT46PAC	11.1	20	16-710G3B	3940	9560308	9514842	Y (K)

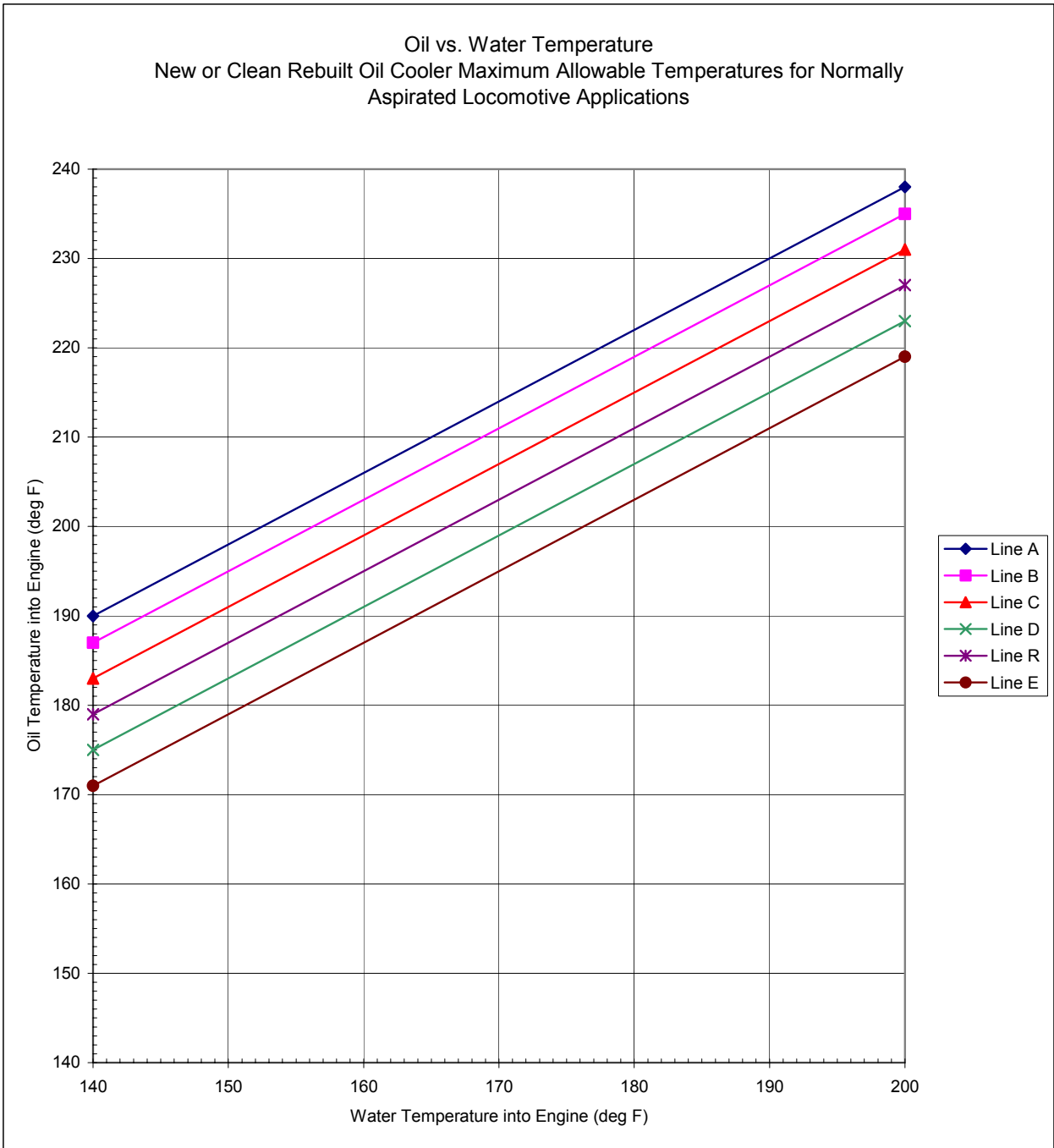


Figure 2. Oil vs. Water Temperatures (Chart Lines A, B, C, D, R, E)

Oil vs. Water Temperature
New or Clean Rebuilt Oil Cooler Maximum Allowable Temperatures for Turbocharged
Engine Applications

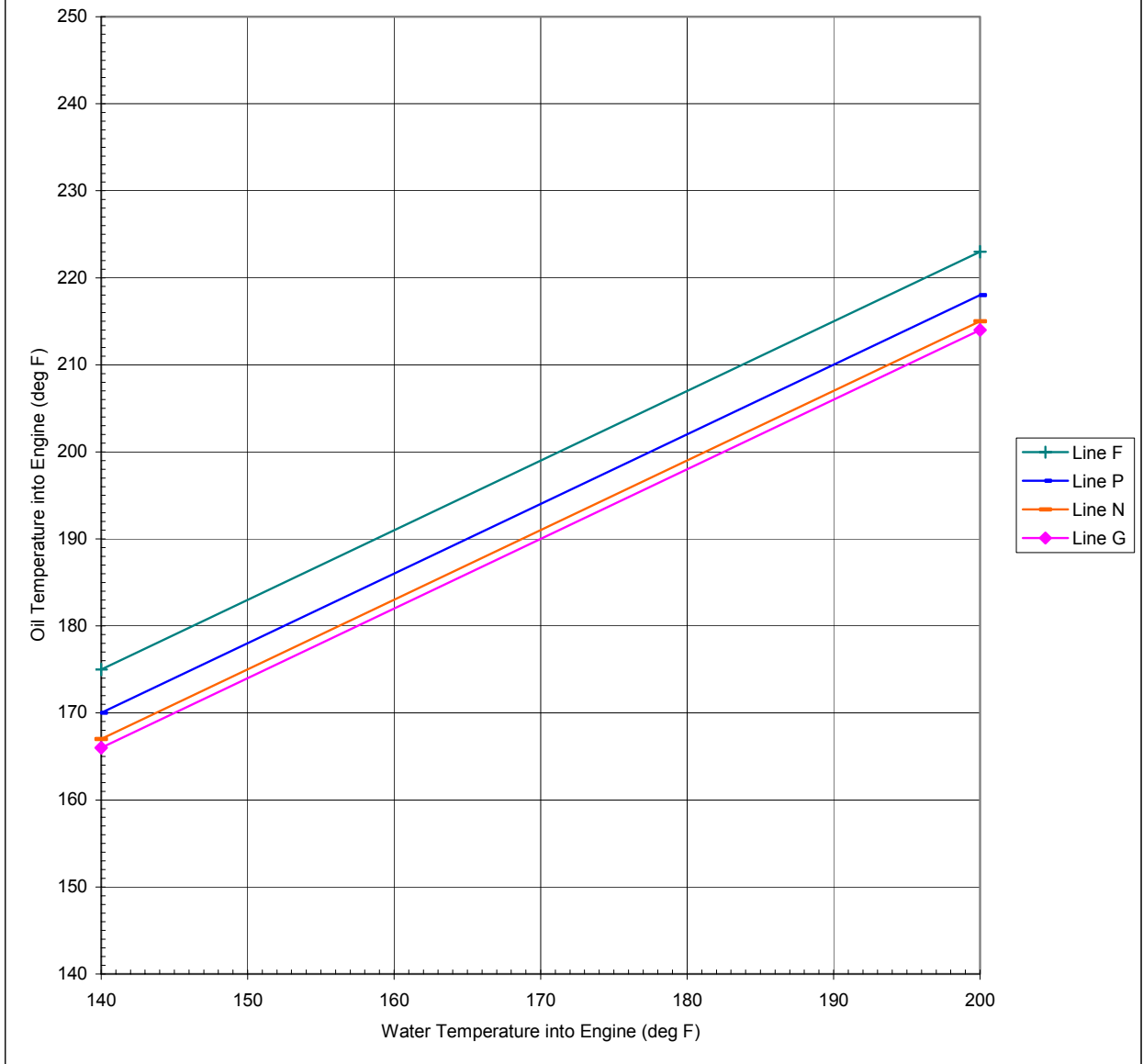


Figure 3. Oil vs. Water Temperatures (Chart Lines F, P, N, G)

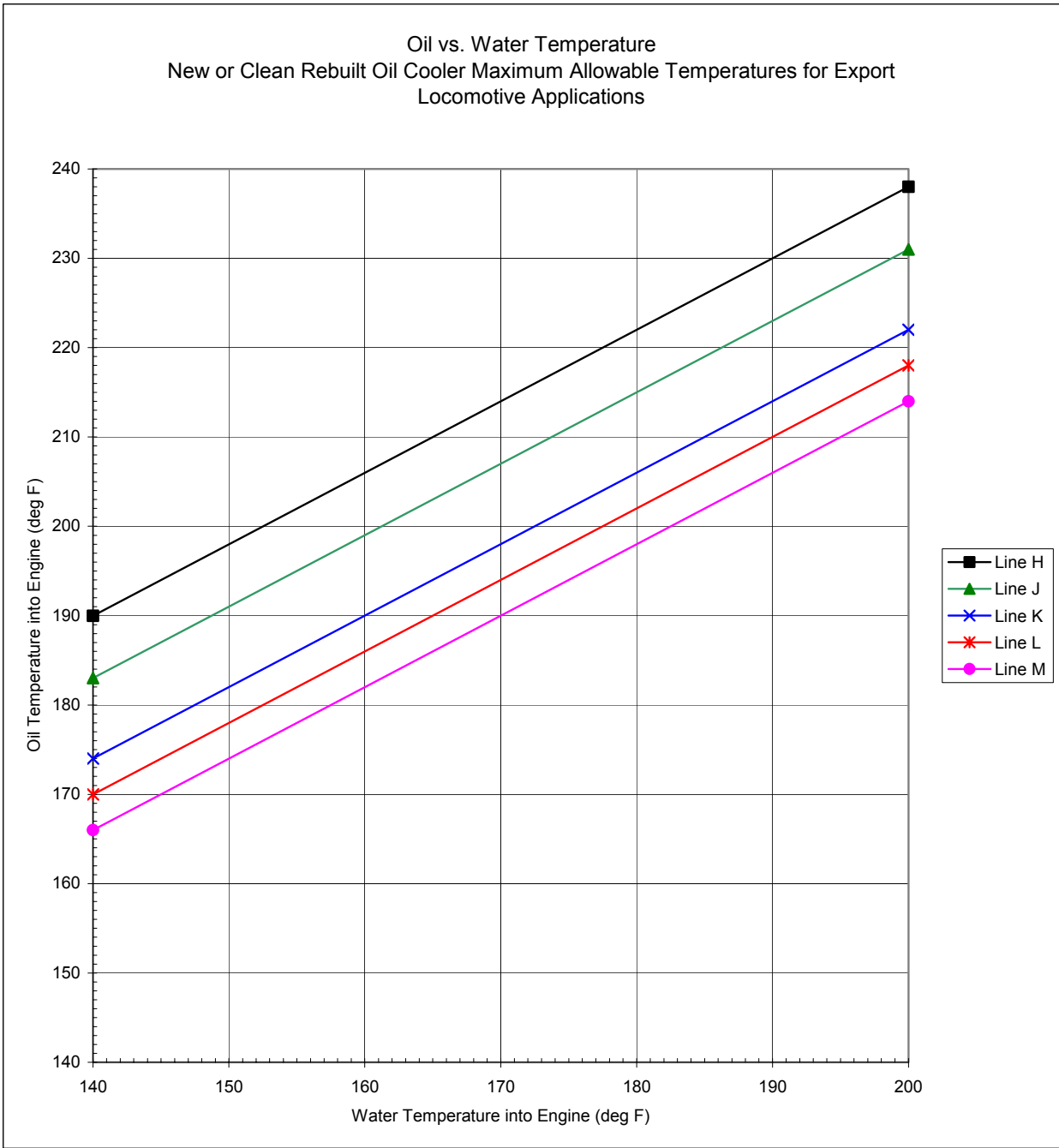


Figure 4. Oil vs. Water Temperatures (Chart Lines H, J, K, L, M)

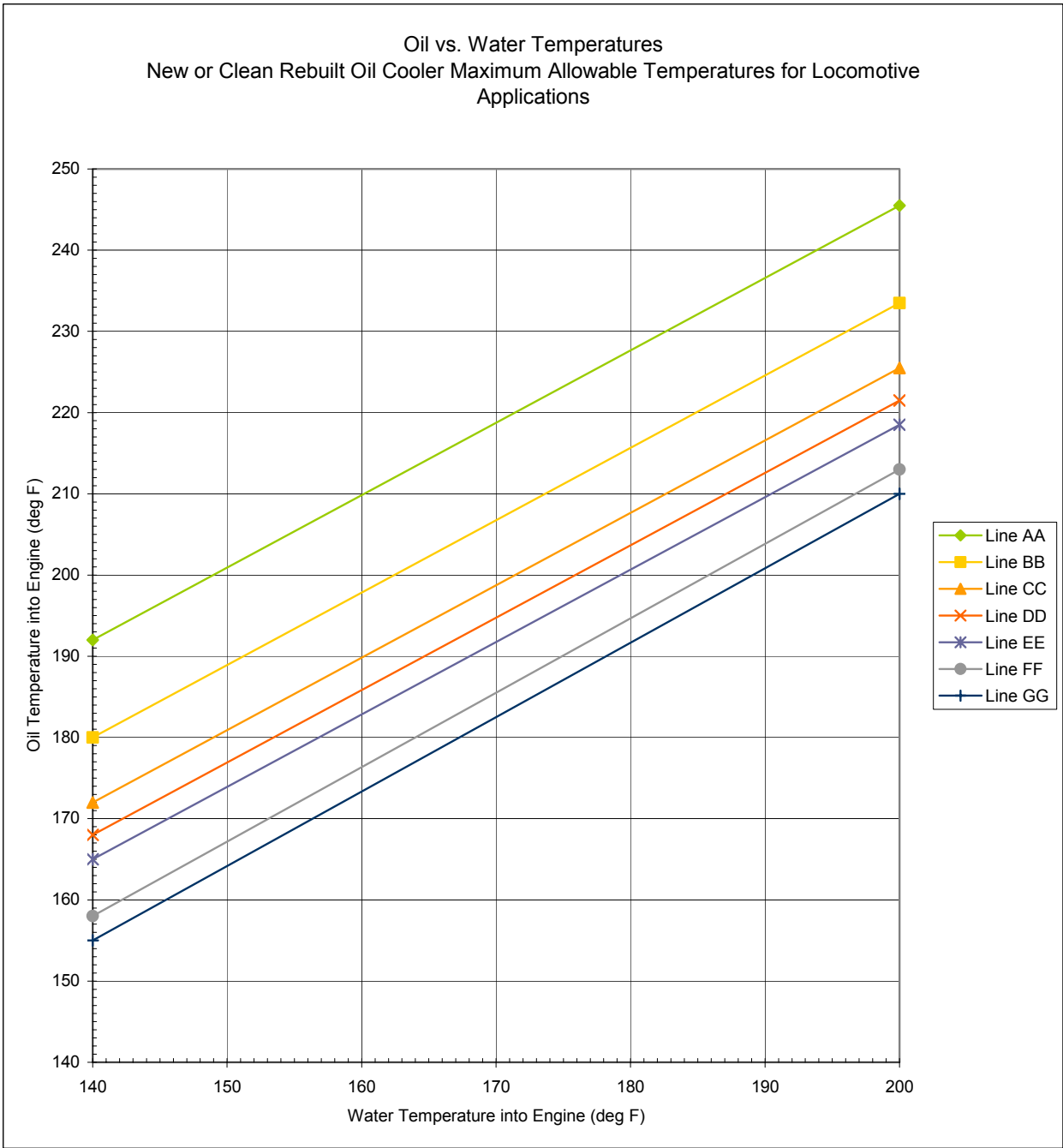


Figure 5. Oil vs. Water Temperatures (Chart Lines AA, BB, CC, DD, EE, FF, GG)

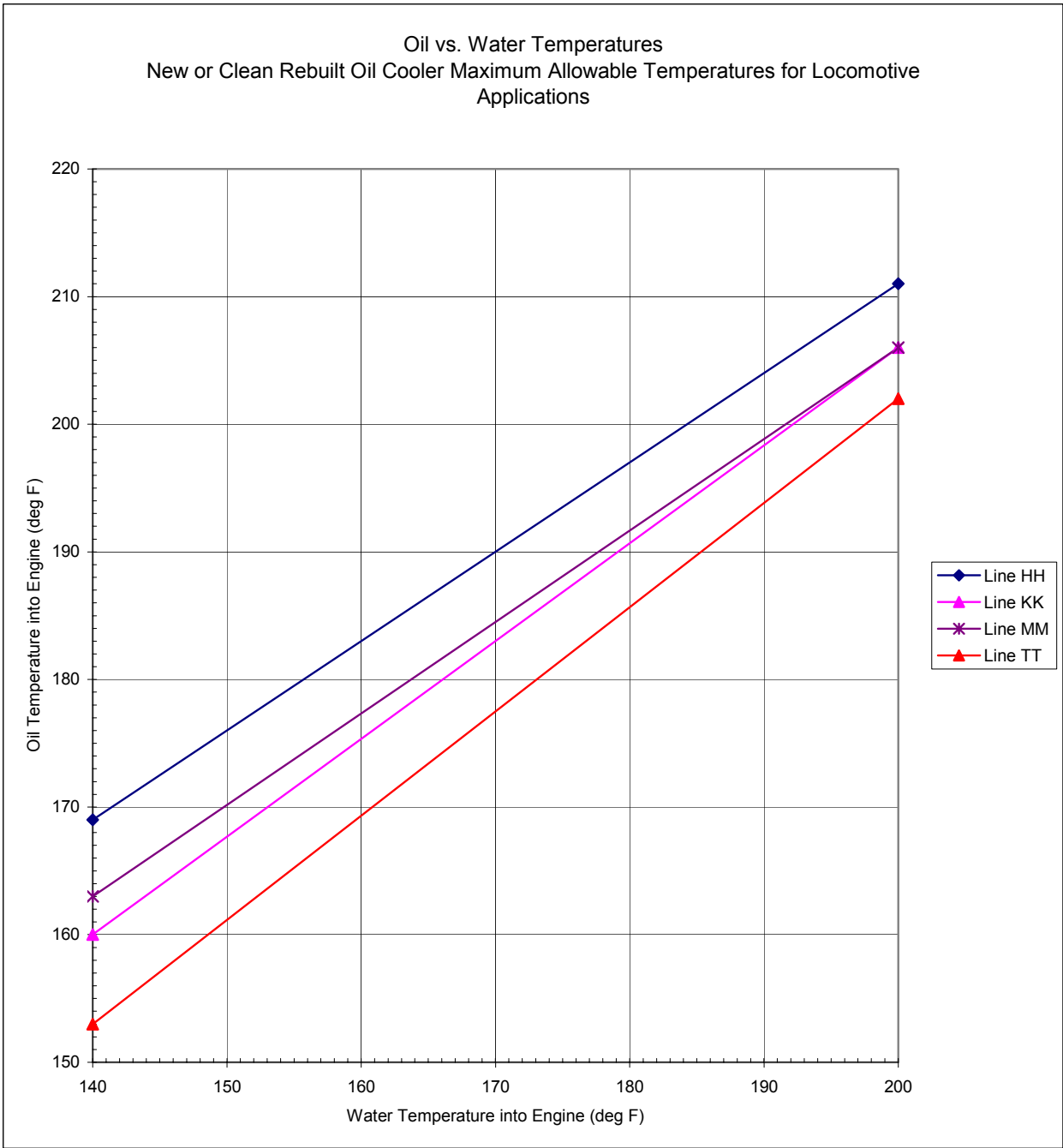


Figure 6. Oil vs. Water Temperatures (Chart Lines HH, KK, MM, TT)

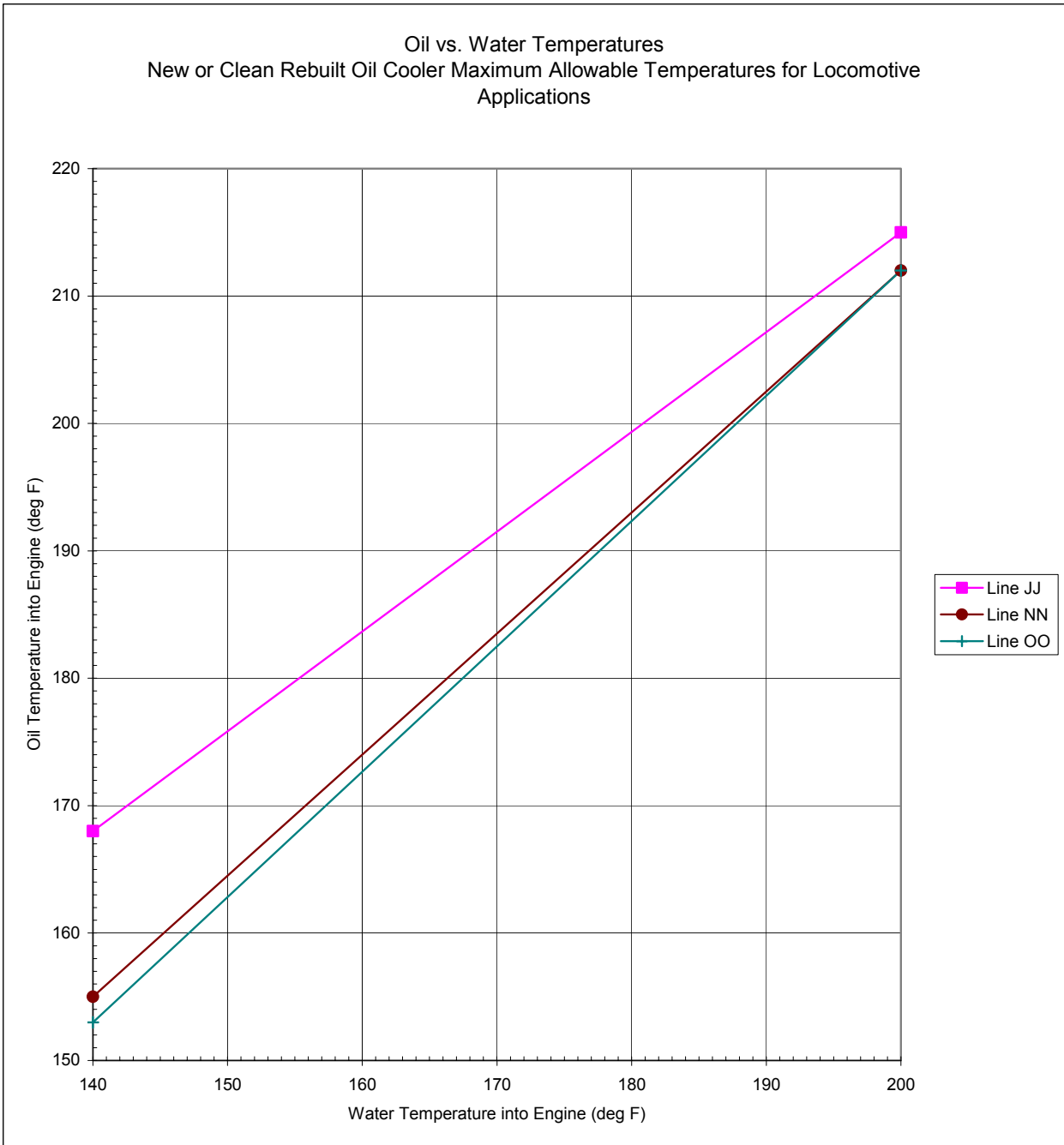


Figure 7. Oil vs. Water Temperatures (Chart Lines JJ, NN, OO)

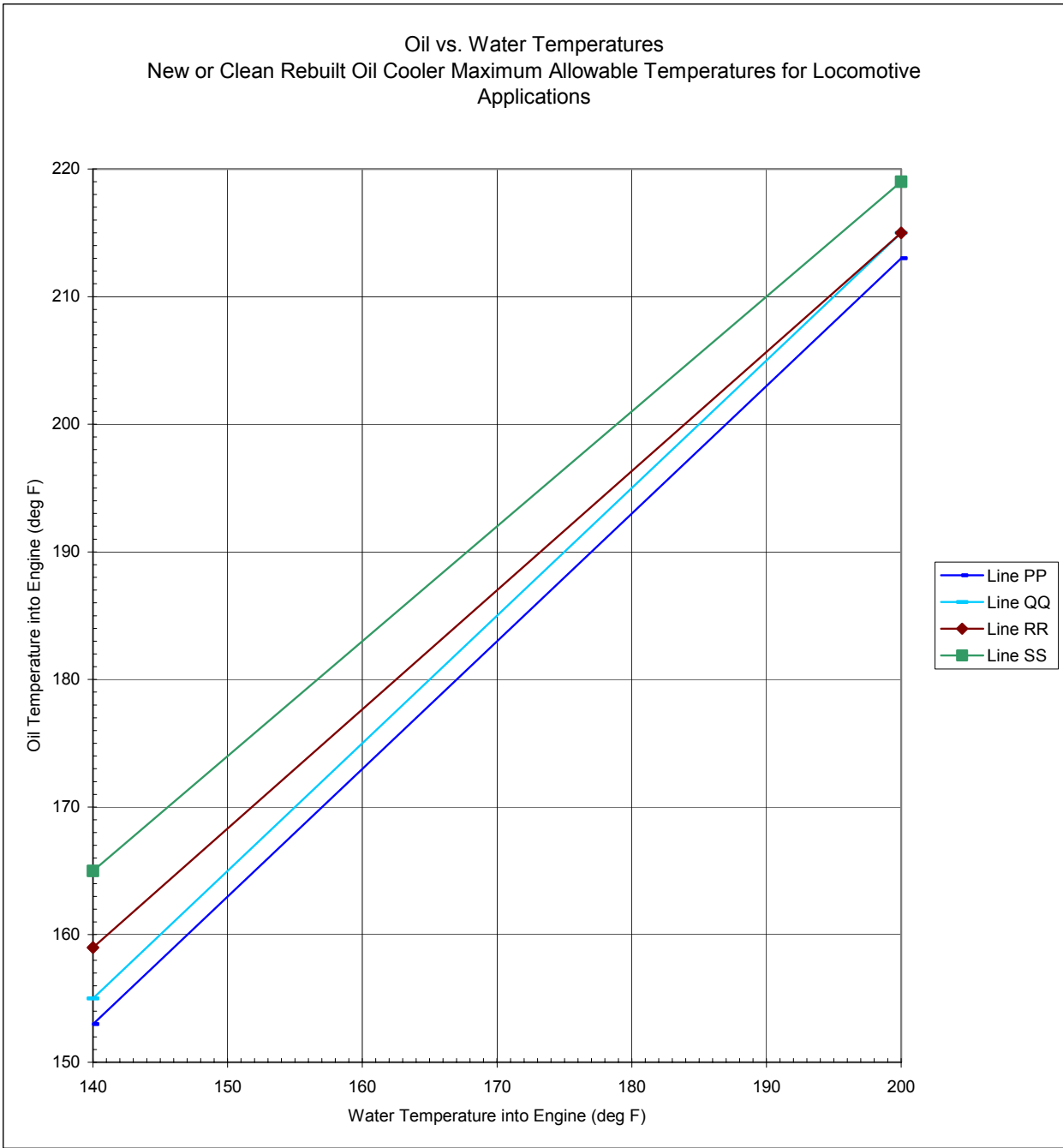


Figure 8. Oil vs. Water Temperatures (Chart Lines PP, QQ, RR, SS)

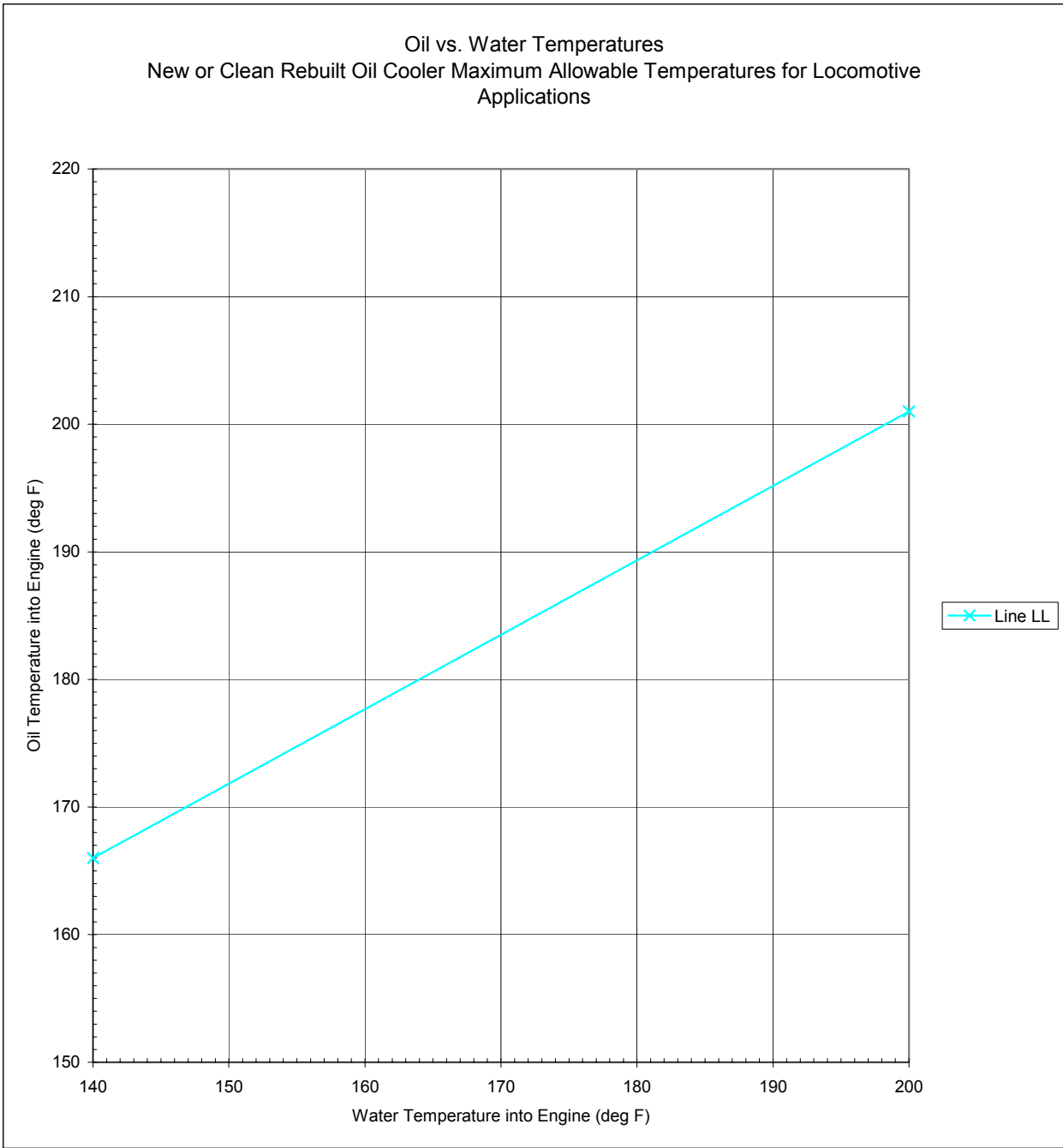


Figure 9. Oil vs. Water Temperatures (Chart Line LL)

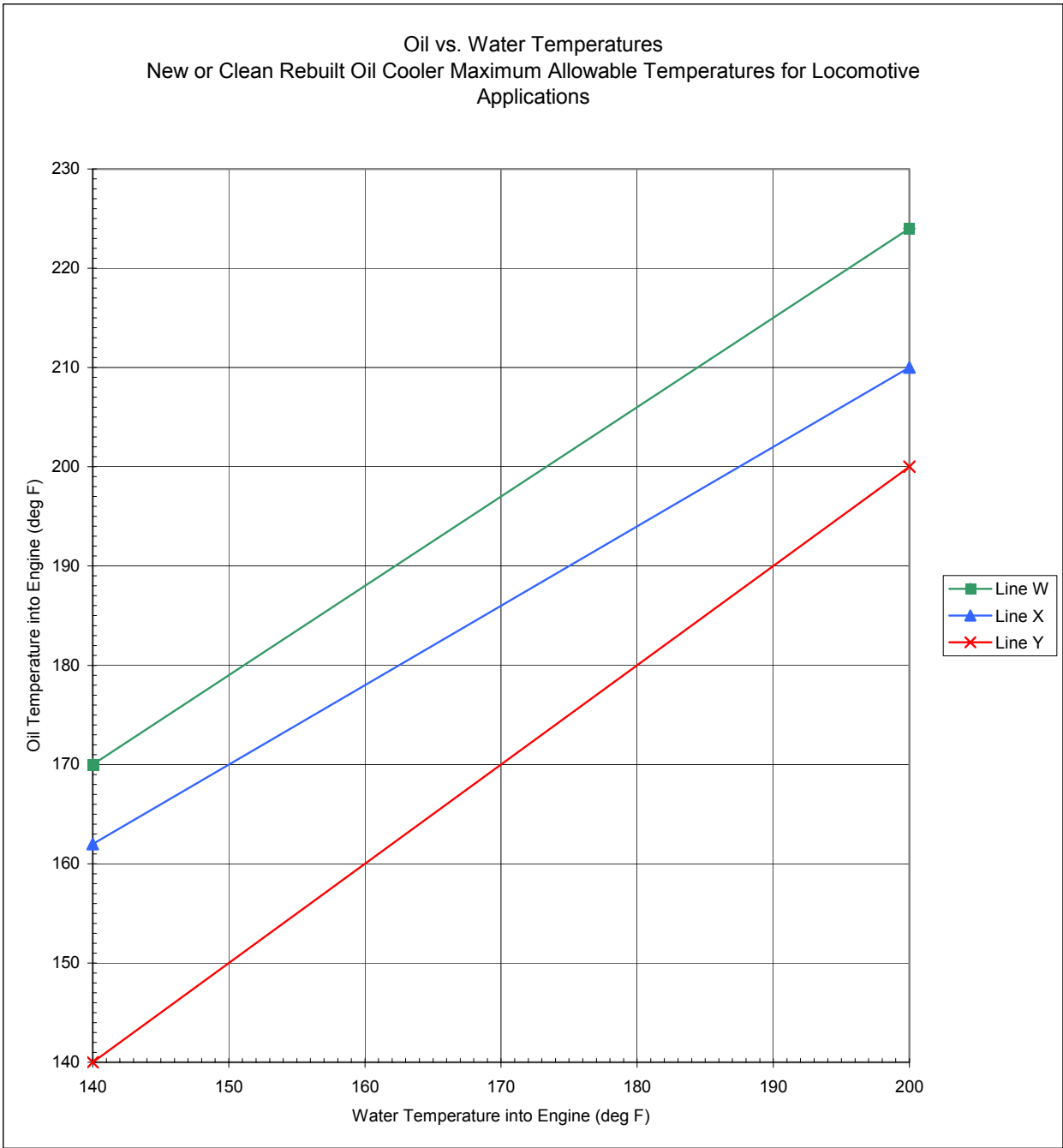


Figure 10. Oil vs. Water Temperatures (Chart Lines W, X, Y)

Oil vs. Water Temperatures
New or Clean Rebuilt Oil Cooler Maximum Allowable Temperatures for Locomotive
Applications

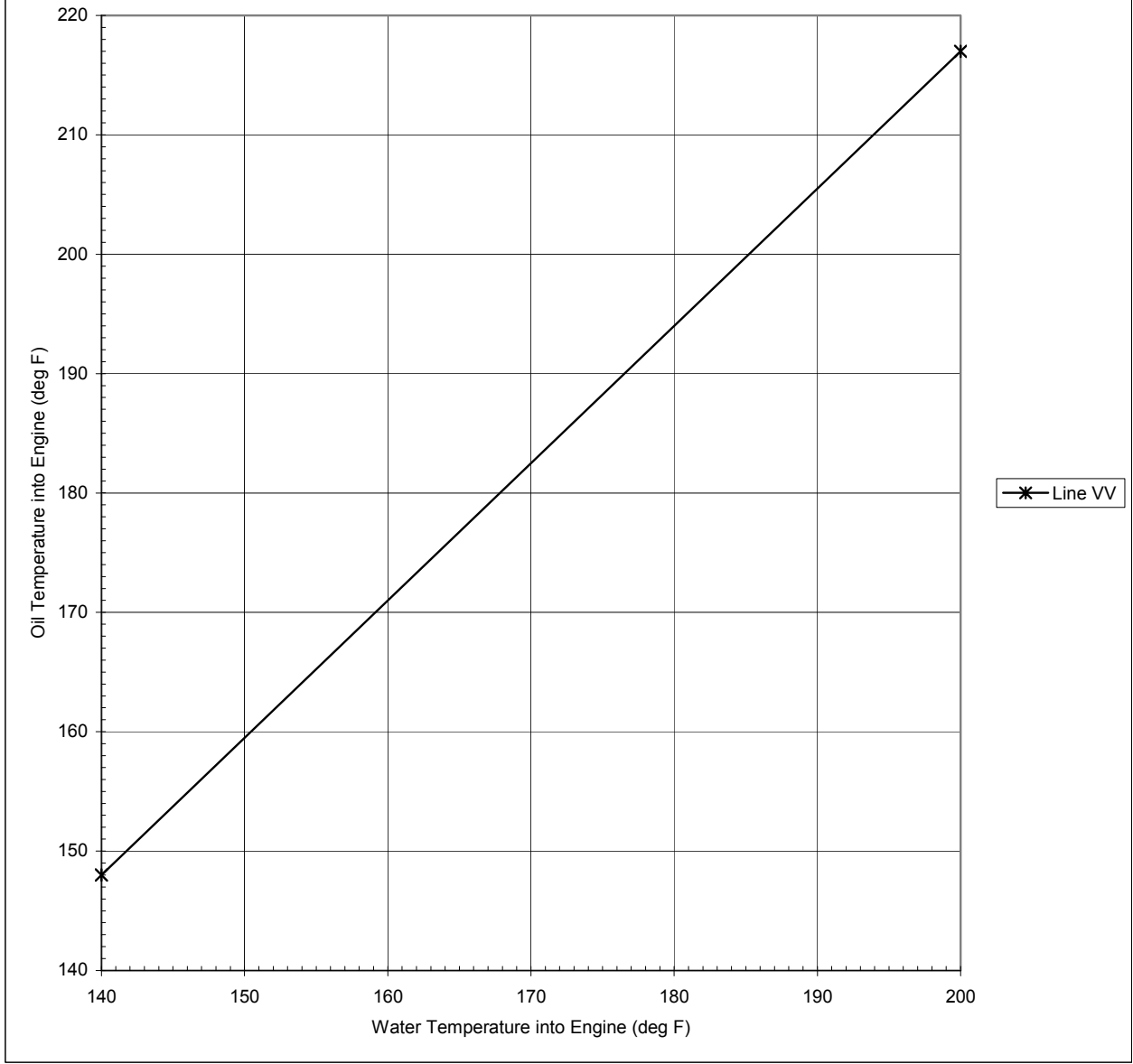


Figure 11. Oil vs. Water Temperatures (Chart Line VV)

3.0 SERVICE DATA

3.1 RELATED MAINTENANCE INSTRUCTION

Lube Oil CoolersM.I. 927

3.2 EQUIPMENT LIST

Thermometer Well, ¼" NPT.....8268162

Caged Thermometer - Nominal Range 65–120° C (150-250° F)

Tube-type Thermometer - Nominal Range 50–100° C (122-212° F)

(DE-L)

General Motors Electro-Motive
La Grange, Illinois 60525 USA
Telephone: 708-387-6000
Website: www.gmemd.com

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