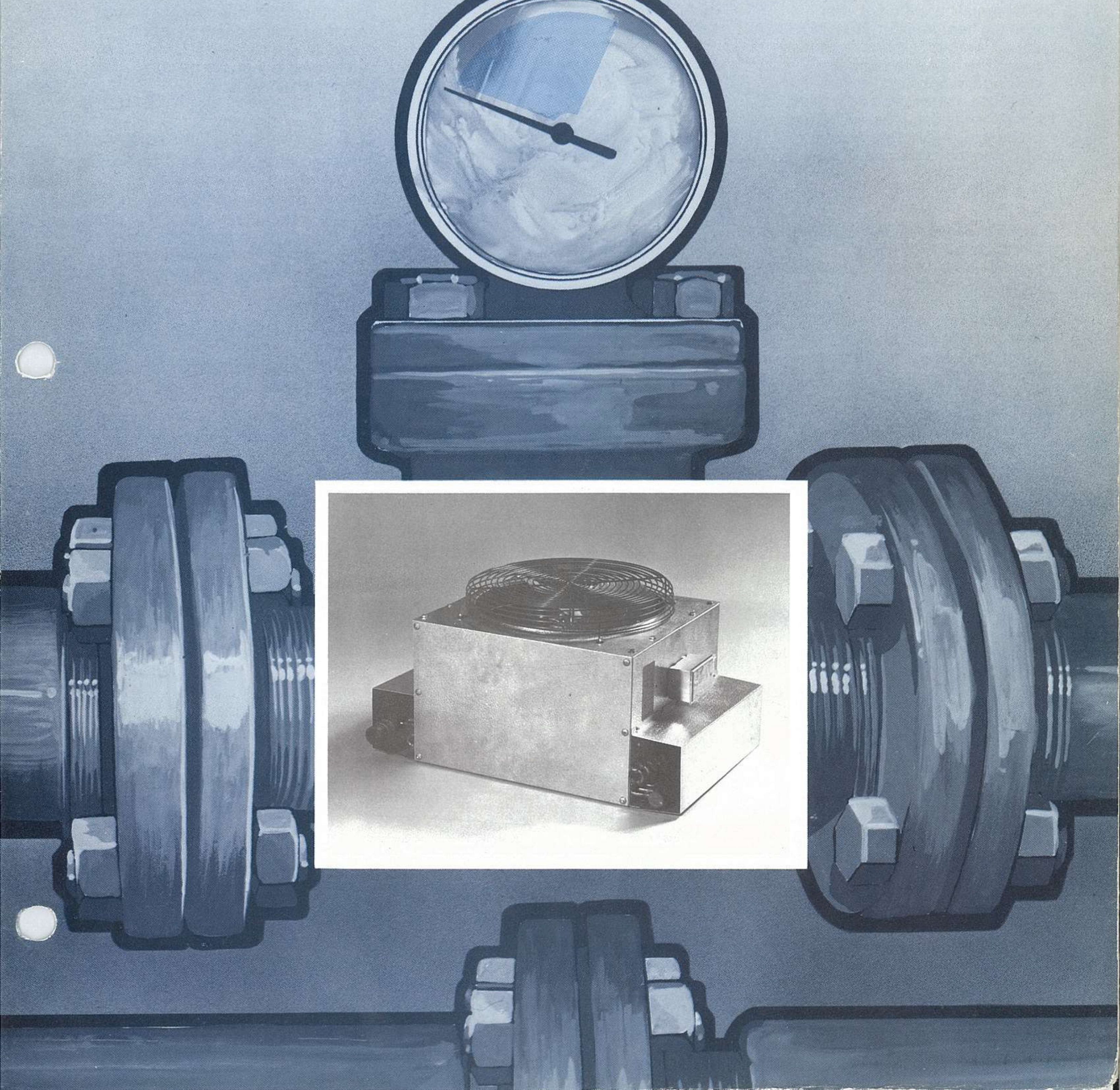
Russell Industrial Oil Coolers



RUSSELL'S OIL COOLERS

Russell's forced air industrial oil coolers provide maximum heat extraction from oils for many industrial applications such as: hydraulic machinery and controls, compressors, engine oils, transformer oils, cutting oils and drives and reduction gears. The Russell Industrial Oil Cooler uses essentially the same heat exchanger which is in thousands of factories throughout the world, providing after—cooling for compressed air.

Russell's forced air cooled oil coolers are available in 13 sizes up to 600 thermal horsepower. For maximum heat transfer, Russell's unique "swirlator" swirls the hot oil through the tubes, continually exposing the hot oil to the tubing wall. This action maximizes heat extraction by the cool air being drawn through the high energy efficient rippled fin, staggered tube heat exchanger.

FEATURES

"Swirlator"

Russell's unique "swirlator" swirls the oil through the oil cooler for maximum heat transfer. The swirling action causes the hotter oil in the center of the flow through the tubes to be swirled to the outside of the flow coming in direct contact with the cooler heat exchange surface extracting the heat from the oil.

Coil Surface

Ripple fin (up to 12 fins per inch) staggered tube coil design results in maximum heat rejection capacity. The heat exchangers are circuited for optimum fluid side pressure drop.

MECHANICAL SPECIFICATIONS

Cooling Coil

Manufactured from highest purity copper tube in a staggered tube pattern with fully collared, plate type rippled aluminum fins, mechanically bonded to the tubes. All units are tested at 300 PSI with dry air under water. Working pressure 300 PSI at 350°F. Approximate burst 1500 PSI at 350°F.

Housings

The ROC models are horizontal discharge, constructed from heavy gauge textured aluminum (ROC-5 and 7½ — galvanized housing). All OTD models are vertical discharge and are made from sturdy, heavy gauge, galvanized steel. The housings are designed to provide maximum housing ridigity as well as resistance against corrosion.

Fans

All fan blades are constructed of heavy gauge aluminum, operated at low tip speeds and statically balanced.

Fan Guards

Plated heavy gauge wire guards.

Motors and Wiring

All motors are equipped with overload protectors for group installation. The direct drive ball bearing motors are drip proof, permanent split capacitor type, 200-230V, 60 cycle, single phase. ROC models use sleeve bearing, shaded pole and are all wired single phase connection. OTD models up to 17 are wired single phase as standard. Large models are wired three phase. All units are factory wired and all leads marked and readily accessible in the rain tight "J" box.

Options

ROC Models — 115V/1Ø motors at no additional cost

OTD Models — 460V/1Ø motors at additional cost
— 230/460V/3Ø motors at additional cost
— TEFC motors at additional cost
— Explosion proof motors at additional cost

Oil Cooler Capacities

Capacity curves based on following conditions:

60 SSU Oil Viscosity
180°F Entering Oil Temp.
95°F Entering (Ambient) air temp.

Oil Cooler Selection Procedure

1. Determine heat load to be rejected from oil. If horsepower is given, convert to BTU/HR: Load, BTU/HR = 2545 × HP.

2. If oil and/or air temperature vary from the nominal chart conditions stated above, divide BTU/HR value determined in 1 above by correction factor from Chart 2.

$$\text{Load } \frac{\text{BTU/HR.}}{\text{Corr. Factor}} = \text{CAT. BTU/HR}$$

(Equivalent at catalog rated conditions.)

3. Using value obtained in 2 and given oil gpm, select cooler model from Chart 1.

4. Determine oil pressure drop. Enter Chart 3 with given gpm and find pressure drop from proper chart line for model selected from step 3. This pressure drop will be correct for 60 SSU oil. For other oil viscosities, multiply pressure drop from Chart 3 times ΔP Correction Factor from Chart.

4. Chart 5 may be used as a guide for oil viscosities.

EXAMPLE 1.

Select cooler to dissipate 150 HP from 60 gpm of SAE 30 oil. Oil entering the cooler is 200°F. Ambient air is 100°F.

$$\text{Load, BTU/HR} = 150\text{ HP} \times 2545 \frac{\text{BTU/HR}}{\text{HP}} = 382{,}000\text{ BTU/HR}$$

Capacity correction factor from Chart 2 = 1.17

$$\text{Capacity at nominal cooler rated conditions} = \frac{382{,}000}{1.17} = 326{,}000\text{ BTU/HR}$$

From Chart 1, select model <u>OTD-26.</u>

Oil pressure drop at rated conditions from Chart 3 is 5.2 psi.

$$\text{Oil temp. drop} = \frac{\text{BTU/HR}}{218^{*} \times \text{GPM}} = \frac{382{,}000}{218 \times 60} = 29^{\circ}\text{F.}$$

$$\text{Avg. oil temp.} = 200 - \frac{29}{2} = 186^{\circ}\text{F.}$$

Avg. oil viscosity from Chart 5 is 89 SSU.

Oil ΔP corr. factor from Chart 4 is 1.73.

Oil ΔP = 5.2 × 1.73 = <u>9.0 psi.</u>

EXAMPLE 2.

Reject 145,000 BTU/HR from 30 gpm of SAE 10 oil entering the cooler at 175°F. Ambient (entering) air is 100°F.

Capacity correction factor from Chart 2 = .89.

Capacity at nominal cooler rated conditions = $\frac{145{,}000}{.89}$ = 163,000 BTU/HR.

From Chart 1, select model <u>OTD-17.</u>

Oil pressure drop at rated conditions from Chart 3 = 2.7 psi

Oil temp. drop = $\frac{\text{BTU/HR}}{218^{*} \times \text{GPM}} = \frac{145{,}000}{218 \times 30} = 22°\text{F}.$

Avg. oil temp. = $175 - \frac{22}{2} = 164°\text{F}.$

Avg. oil viscosity from Chart 5 is 69 SSU.

Oil ΔP corr. factor from Chart 4 is 1.23.

Oil ΔP = 2.7 × 1.23 = <u>3.3 psi.</u>

EXAMPLE 3.

Cool 22 gpm of SAE 10 oil from 160°F to 130°F. Ambient air is 90°F.

Load = 218 * × 22 gpm × (160 - 130)°F = 144,000 BTU/HR.

Capacity correction factor from Chart 2 is .83.

Capacity at nominal rated conditions = $\frac{144{,}000}{1000 \times .83}$ = 174,000 BTU/HR.

From Chart 1, select model <u>OTD-26.</u>

Oil pressure drop at rated conditions from Chart 3 = 1.8 psi.

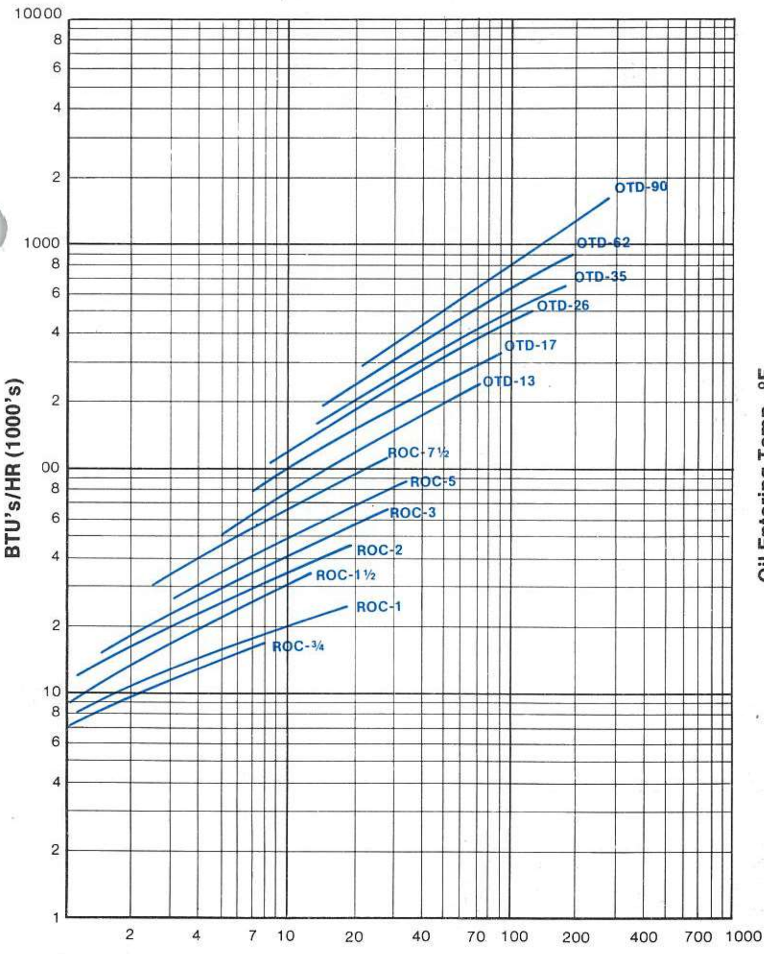
Oil viscosity at avg. temp. (145°F) from Chart 5 is 88 SSU.

Oil ΔP corr. factor from Chart 4 is 1.7.

Oil ΔP = 1.8 × 1.7 = <u>3.1 psi.</u>

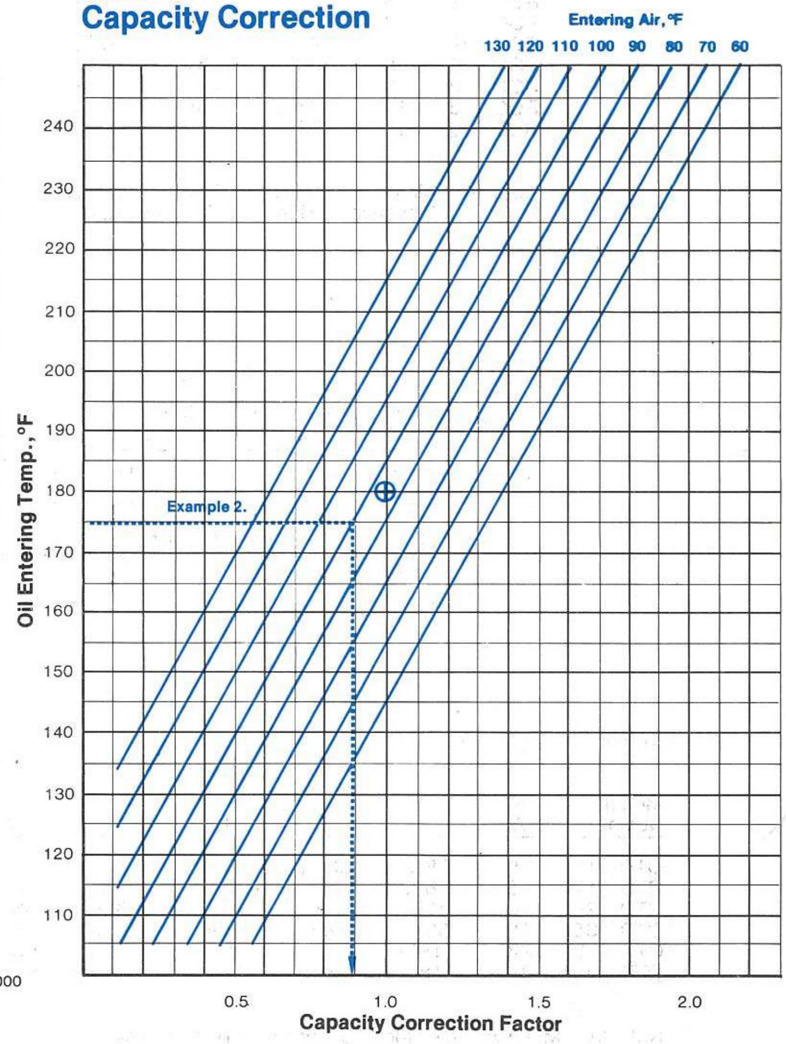
* Constant 218 = 7.26 #/GAL × .5 BTU/HR Spec. Heat × 60 MIN/HR.

Chart 1
Unit Selection



Russell Coil Oil Coolers w/the "Swirlator", Capacities In MBH
For: 180 F Ent. Oil; 95° F Ent. Air (AMB); 60 SSU Oil

Chart 2
Capacity Correction



Russell Oil Cooler Temperature Correction Factors
(Capacity curves based on: 180° F Ent. Oil/95° F Ent. Air)

Chart 3
Oil Pressure Drop

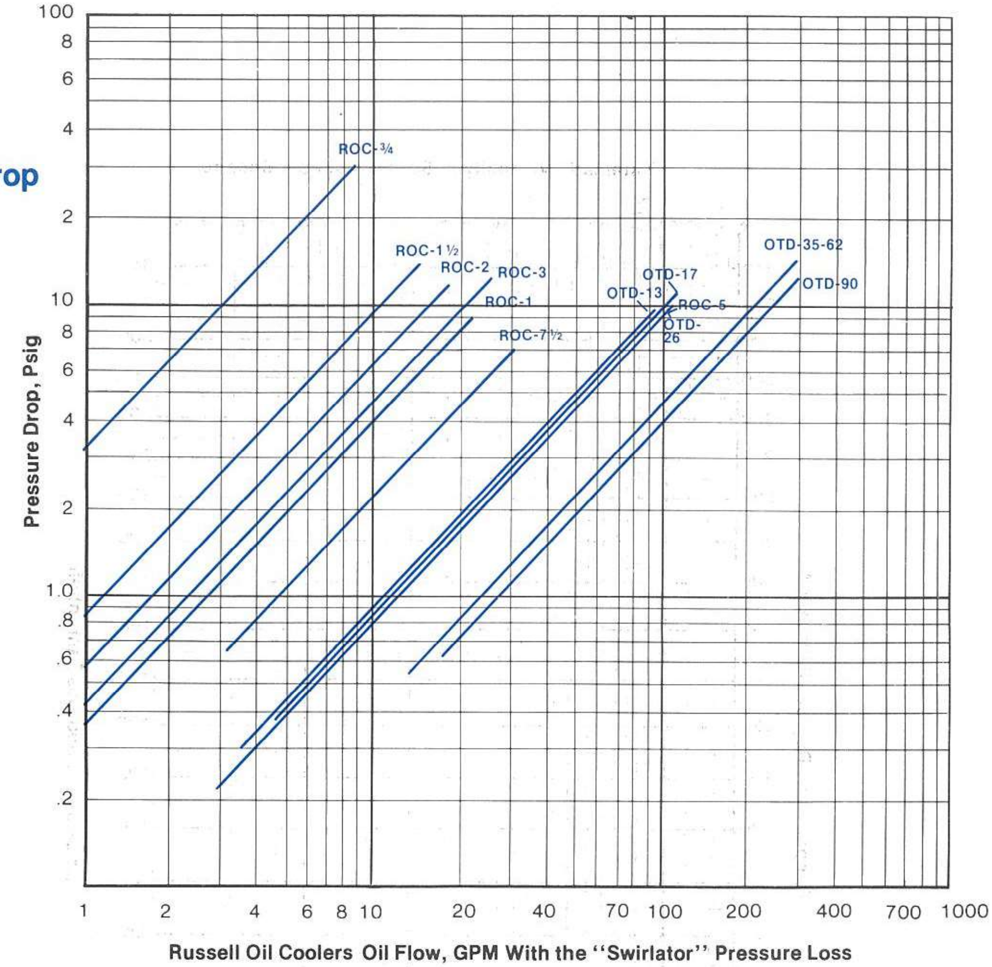
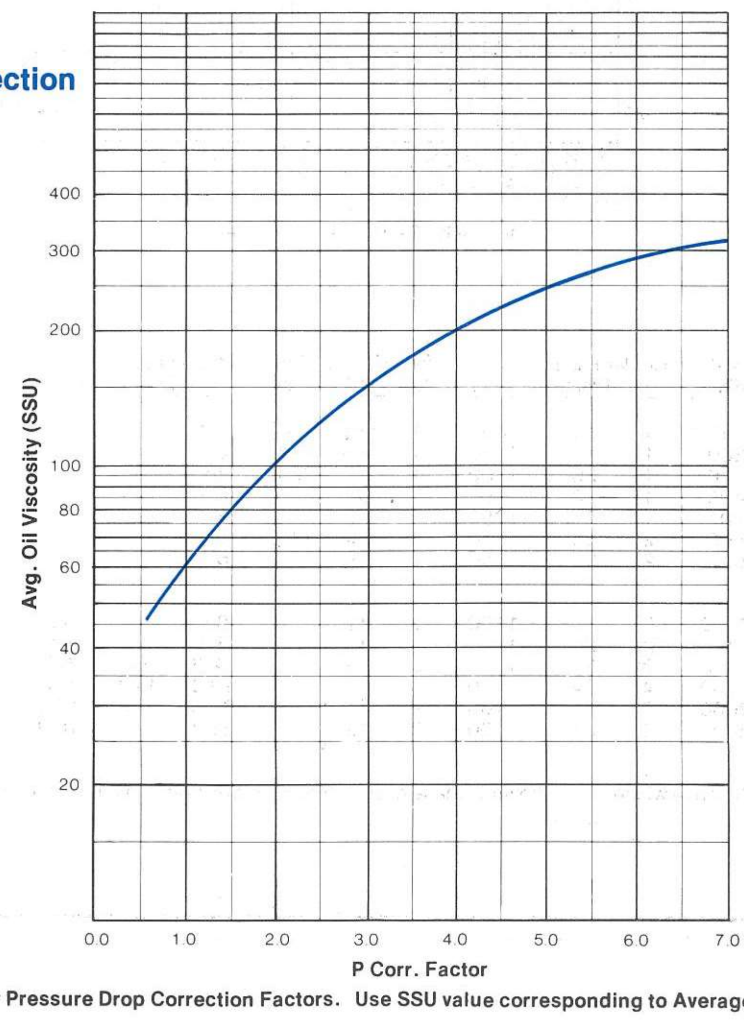
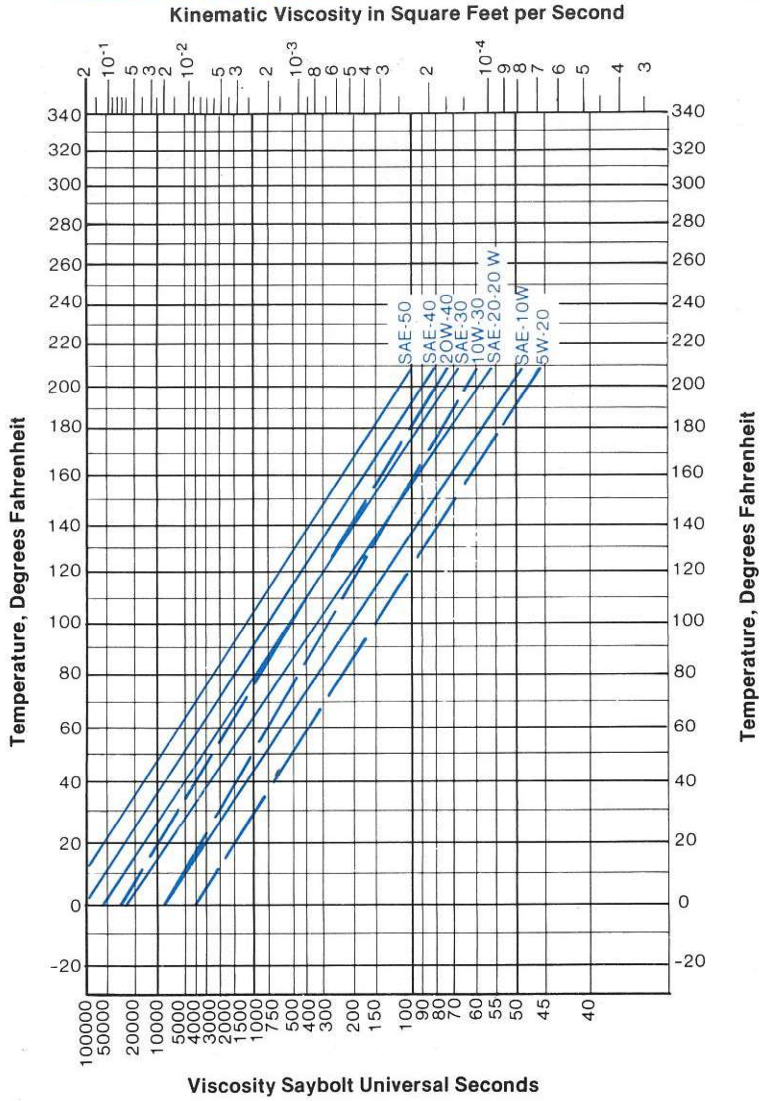


Chart 4 Viscosity Correction



Oil Cooler Pressure Drop Correction Factors. Use SSU value corresponding to Average Oil Temp.

Chart 5
Effect of Temperature on SAE Crankcase-Oil Viscostiy

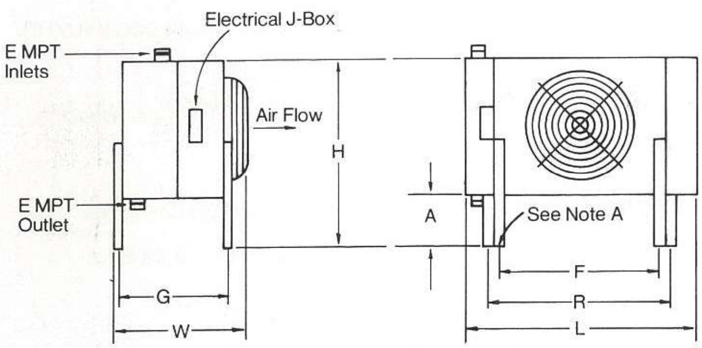


Specifications

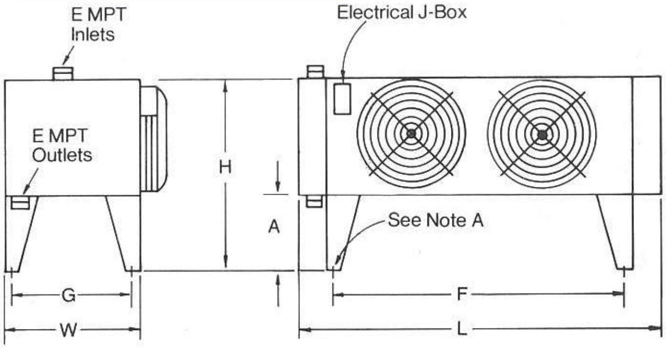
Model Number	Total CFM	Cooler Fans No	Cooler Fans Diam.	RPM	Fan Motors No	Fan Motors HP	Total Motor Amps. 115V	200-230V		460V		Wiring Stand.	Optional Arrangement
ROC ¾	1440	1	16"	1050	1	1/12	4.0	2.0				1 phase	
ROC 1	1200	1	16	1050	1	1/12	4.0	2.0				1 phase	
ROC 1½	2600	1	20	1050	1	1/6	5.6	2.8				1 phase	
ROC 2	2400	1	20	1050	1	1/6	5.6	2.8				1 phase	
ROC 3	2800	1	20	1050	1	1/6	5.6	2.8				1 phase	
ROC 5	5500	2	20	1050	2	1/6	11.2	5.6				1 phase	
ROC 7	7000	2	20	1050	2	1/6	11.2	5.6				1 phase	
OTD 13	10800	2	24	1100	2	½		8.4		4.2		1 phase	
OTD 17	9800	2	24	1100	2	½		8.4	**	4.2	**	1 phase	
OTD 26	14700	3	24	1100	3	½		12.6	7.3	6.3	3.6	1 phase	3 phase
OTD 35	20000	4	24	1100	4	½		16.8	11.1	8.4	5.6	1 phase	3 phase
OTD 62	49000	9	24	1100	9	½		21.8		10.9		3 phase	
OTD 90	42000	9	24	1100	9	½		21.8		10.9		3 phase	

** For optional 3 phase wiring, units shown 3 phase have 1 phase motors arranged 3 phase delta.

ROC Models ¾ thru ROC 3



ROC Models 5 and 7½

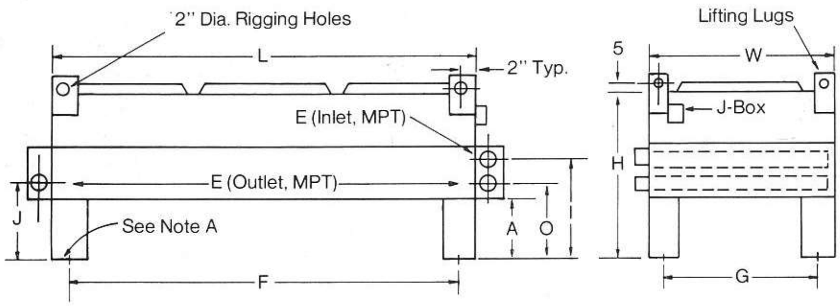


Dimensions in Inches

Model Number	A	F	G	H	L	W	R	E MPT	Approx. Shipping Wt.
ROC ¾	18	19⅛	13½	36¼	26	16	21	½	58 #
ROC 1	18	19⅛	13½	36¼	28¾	16	21	½	65
ROC 1½	18	23⅛	13½	42¼	30	17	25	½	89
ROC 2	18	23⅛	13½	42¼	32¾	17	25	½	110
ROC 3	18	23⅛	13½	42¼	30	17	25	¾	145
ROC 5	18	56¼	14½	43⅛	65	20⅛		¾	254
ROC 7½	18	56¼	14½	47⅛	68	20⅛		¾	301

Note "A": Mounting holes for ROC ¾-3 — ½" diam.
Mounting for ROC 5 & 7½ — ⅝" sq.

OTD Models 13 thru 90



Dimensions in Inches

Model Number	A	F	G	H	L	W	E MPT	I	O	J	Approx. Shipping Wt.
OTD 13	15	58¾	38¾	34	63¼	43½	1¼	24	—	21⅜	445 #
OTD 17	15	58¾	38¾	34	63¼	43½	1¼	23⅞	18¾	—	541
OTD 26	15	88¾	38¾	34	93¼	43½	1¼	23⅞	—	17½	806
OTD 35	15	58¾	78¾	35½	63¼	83½	1½	23⅞	18¾	—	991
OTD 62	22	118½	88¾	42¾	123½	93½	1½	23⅞	21¼	—	2315
OTD 90	22	118½	88¾	42¾	123½	93½	2	23¼	—	18	2960

Note "A": Mounting holes for OTD models 7/16 × 3/4 slots

Russell

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