Bulletin Data Sheet for the Design of Air Exchange Coolers

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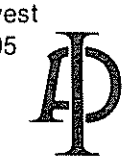

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Note:
This is the second edition of this publication as a bulletin. It contains editorial revisions and replaces the first edition

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API BULLETIN FOR DESIGN OF AIR EXCHANGE COOLERS

Foreword

a. This bulletin is under the jurisdiction of the Committee on Standardization of Production Equipment of the American Petroleum Institute

b. Packaged compressor units used in the production of oil and gas normally consist of a reciprocating gas compressor, an internal combustion engine, and a gas cooler using air as the cooling medium. The selection of the gas compressor is usually based on standards and ratings established by the Natural Gasoline Supplymen's Association. The purpose of this bulletin is to provide a basis for the design of air exchange coolers for packaged compressor units

c. Other standards relating to the material in this bulletin include the following:

d. Attention Users of this Publication: Portions of this publication have been changed from the previous edition. The location of changes has been marked with a bar in the margin. In some cases the changes are significant, while in other cases the changes reflect minor editorial adjustments. the bar notations in the margins are provided as an aid to users to identify those parts of this publication that have been changed from the previous edition, but API makes no warranty as to the accuracy of such bar notations

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RP 500B: Recommended Practice for Classification of Areas for Electrical Installations at Drilling Rigs and Production Facilities on Land and on Marine Fixed and Mobile Platforms.

Classifies areas surrounding drilling rigs and production facilities on land and on marine fixed and mobile platforms for installation of electrical equipment

Spec 12J: Specification for Oil and Gas Separators.

Covers minimum requirements for the design, fabrication, and plant testing of oil and gas separators and/or oil-gas-water separators used in the production of oil and/or gas, and usually located at some point on the producing flow line between the wellhead and pipeline.

Spec 12K: Specification for Indirect Type Oil-field Heaters.

Covers minimum requirements for the design, fabrication, and plant testing of oilfield type indirect heaters used in the production of oil and/or gas, and usually located at some point on the producing flow line between the wellhead and pipeline.

SECTION 1
SCOPE

1.1 Coverage. This bulletin contains engineering data sheets for the design of air exchange coolers for packaged compressor units. A standard form for specifying the data is provided.

1.2 Policy. Nothing contained in this bulletin is to be construed as granting any right, by implication or otherwise, for manufacture, sale, or use in connection with any method, apparatus, or product covered by letters patent, nor as insuring anyone against liability for infringement of letters patent. This bulletin is for the convenience of purchasers and manufacturers in ordering and producing air exchange coolers. It is not intended to inhibit purchasers and producers from purchasing and producing air exchange coolers meeting designs other than those contained herein.

SECTION 2
DESIGN DATA

2.1 The following form is for the convenience of purchasers in ordering air exchange coolers for packaged compressor units. The first column lists the information needed to properly design a cooler. The second column provides space for the purchaser to record specific needs; and the third column lists the assumptions that may be made by the manufacturer in the absence of specific data from the purchaser.

2.2 Coolers furnished according to these data sheets may be designed on the basis of information given in Column 3 unless otherwise specified by the purchaser.

DATA NEEDED FOR DESIGN OF AIR EXCHANGE COOLERS FOR PACKAGED COMPRESSOR UNITS

1	2	3
INFORMATION NEEDED	USERS NEEDS	ASSUMPTIONS MANUFACTURERS MAY MAKE IN ABSENCE OF SPECIFIC DATA
1. ATMOSPHERIC CONDITIONS:		
1.1 Design Ambient Temperature		100 F
1.2 Elevation or Mean Barometric Pressure		1,500 ft
2. JACKET COOLING SECTION:		
2.1 Tube material		Manufacturer's option
2.2 Fin material		Manufacturer's option
2.3 Are engine jackets to be cooled?		Yes
If yes, give following:		
a. Make of engine		
b. Model of engine		
c. RPM of engine		
d. Maximum continuous HP of Prime Mover @_____RPM		
e. Heat reject to cooling water, BTU/HP/Hr		4,200 BTU/HP/Hr — Wet manifold
		3,000 BTU/HP/Hr — Dry manifold
f. Temperature rise across engine, maximum		15 F — Wet manifold
		11 F — Dry manifold
Temperature outlet, maximum		180 F
g. Flow rate, GPM		Fixed by heat load and temperature range.
h. Maximum allowable pressure drop through cooler, psi		5 psi
j. Coolant used if not 100% water		Water
k. Operating pressure, psi		Manufacturer's design pressure
2.4 Are compressor jackets to be cooled?		
If yes, give following:		Yes
a. Make of compressor and model		
b. Size		
c. Operating speed, RPM		
d. Maximum compressor load, BHP		
e. Heat rejection rate, BTU/HP/Hr		400 BTU/HP/Hr — Gas
		500 BTU/HP/Hr — Air
f. Temperature range desired, F		15 F range
g. Flow rate, GPM		Fixed by heat load and temperature range.
h. Maximum allowable pressure drop through cooler, psi		5 psi
j. Coolant used if not 100% water		Water
2.5 Are compressor and engine jackets to be combined in one cooling section?		Yes

1	2	3
INFORMATION NEEDED	USERS NEEDS	ASSUMPTIONS MANUFACTURERS MAY MAKE IN ABSENCE OF SPECIFIC DATA
2.6 Is separate oil cooler section to be provided? If yes, give following data:		No
a. Flow rate, GPM		
b. Temperature range required, F		
c. Viscosity at operating temperature, SSU		
d. Operating pressure, psi		
e. Allowable pressure drop, psi		
(If separate oil cooler sections are required for engine and compressor, give data for both.)		No
3. GAS COILS:		
Give the following information for gas coil, intercooler or aftercooler:		
a. Maximum allowable working pressure, psi		110% of, or 50 psi above, the discharge pressure, whichever is greater, at an assumed temperature of 350 F
b. Construction		ASME Code*
(1) Required test pressure, psi		ASME Code*
(2) ASME Code Stamp*		Not required
(3) Corrosion allowance, in.		None
c. Flow rate, CF/D		
(1) Maximum		
(2) Design		
(Give gas coil inlet and outlet pressure for both maximum and design flow rates)		
d. Measuring base, psia and deg. F		14.4 psia and suction temperature
e. "N" Value of Gas		1.26
f. Molecular weight or specific gravity		0.65 sp. gr.
g. Composition of gas, molecular %		Sweet gas
h. Suction temperature to first compressor stage, F		90 F
i. Inlet gas temperature to coil		
j. Inlet pressure to coil, psi		
(1) Maximum		
(2) Minimum		
k. Gas coil discharge pressure, psi		
l. Outlet temperature required, F		130 F Intercooler
		120 F Aftercooler

*ASME Boiler and Pressure Vessel Code: Section VIII, Division 1, Pressure Vessels, available from American Society of Mechanical Engineers, 345 E. 47th Street, New York, N.Y. 10017.

1 INFORMATION NEEDED	2 USERS NEEDS	3 ASSUMPTIONS MANUFACTURERS MAY MAKE IN ABSENCE OF SPECIFIC DATA
m. Allowable pressure drop, psi		1% above 250 psia 2% up to 250 psia
n. Condensable hydrocarbons in gas, when gas analysis not given.		Not considered unless data furnished.
o. Water vapor in gas (Give temperature and pressure at which gas would be water saturated)		100% water saturated at suction conditions.
p. Gas specific heat at operating temperature and pressure		Not considered unless furnished.
q. Gas thermal conductivity at operating conditions		Not considered unless furnished.
r. Gas viscosity, centipoise at operating conditions		Not considered unless furnished.
s. If field depletion problem, where is maximum duty point?		Will design to maximum compressor BHP
t. Tube material		Manufacturer's option
u. Fin material		Manufacturer's option
4. GENERAL		
4.1 Fouling Factors:		
a. Water		.0005
b. Oil		.001
c. Gas		.002
d. Fins		No
4.2 Fan:		
a. Power required, BHP		5% of engine BHP
b. Direction of discharge		Manufacturer's option
c. RPM		Manufacturer's option
d. Bearings		Sealed
e. Peripheral speed, maximum, fpm		14,000 fpm
f. Pitch adjustment		Non-adjustable
4.3 Overload capacity, %		No
4.4 Pass arrangement		Manufacturer's design
4.5 Size limitations		Manufacturer's design
4.6 Code requirements		ASME Code*
4.7 Corrosion allowance, in.		None
4.8 Tube support		Manufacturer's design
4.9 Tube attachment		Manufacturer's design
4.10 Access plugs		Manufacturer's design
4.11 Louvers		Manual
4.12 Hail screen		None
4.13 Bug screen		None
4.14 Personnel guard		Furnished
4.15 Finish		Paint

*ASME Boiler and Pressure Vessel Code: Section VIII, Division 1, Pressure Vessels, available from American Society of Mechanical Engineers, 345 E. 47th Street, New York, N.Y. 10017.