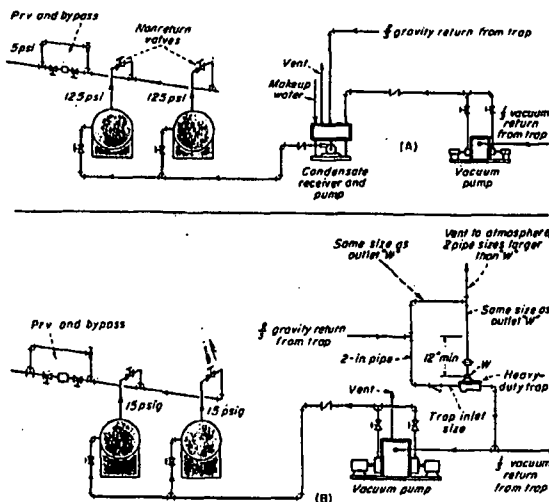


More PLANT PROBLEMS

Another Answer to Jan Question, "How Can We Convert Our Heating Plant?"



ASSUMING several conditions, I can give reasonable answers to LVP's questions. But before making changes, he may avoid expensive headaches by consulting his local boiler inspector. He may be a city, state or insurance-company man.

LVP does not say why his boilers must run at 15 psi. If he is converting for operating convenience or economy and his controls are suitable for the lower pressure, original safety-valve capacity is sufficient. If pressure rises above the control setting, safeties will relieve at their present setting without harm.

If pressure is reduced because of boiler's condition, he must change safety-valve capacity and pop pressure. Remember, steam at 125 psig has a specific volume of 3.2 cu ft per lb; at 15 psig its volume is 13.8 cu ft per lb. This is an increase of about 4.3 times. Besides the increased volume, pressure available to force steam through the valve is less. With a smaller pressure differential, valve capacity is less.

Steam flow through a safety valve approximates flow through an orifice. By applying rules for orifice flow the lower pressure differential becomes obvious. Also, maximum flow can be computed. LVP has two courses. He can have boilers reclassified as low-pressure units

to operate at 15 psig. New safety valves will have to be fitted. Or, second, he can keep boilers in their present classification (boiler inspector permitting) and run at 15 psig. Safety valves to relieve at slightly higher than 15 psig are advisable.

Classifying the boilers as l-p heating units introduces several economic advantages other than fuel savings. Local codes usually permit a reduction in number of operators, and there should be a substantial decrease in insurance premiums. This may be as much as 50%. Cost to convert boilers to run and be classified as l-p heating units is less than converting for 15-psig operation while remaining power boilers.

Code for Power Boilers applies to any unit operating at a pressure above 15 psig. If safety valve is set above this pressure, unit is classified as a power boiler. He can base safety-valve capacity on some pressure above desired operating pressure. Setting then becomes allowable working pressure.

To conform to Code without reclassification, relieving capacity for stoker-fired firetube boilers must be at least 7 lb per hr per sq ft heating surface. Assuming this boiler has about 1450 sq ft of heating surface and runs at 15 psig with safeties set at 16 psig, output

would be 10,150 lb per hr. This is the minimum allowable relieving capacity. Minimum area of boiler opening safety-valve connection, based on Code requirements, is 45.8 sq in. The existing 3½-in. safety valves have a total opening area of 19.8 sq in. If needed to a 3½-in. pipe.

To furnish additional area, Code permits installation of extra pipe on the steam line between boiler and main stop valve except when boiler is a superheater.

Assuming steam outlet on boiler is same size as nonreturn valve, or 6 in., additional area can be provided by setting a tee at boiler outlet and connecting safety to it. If a 6-in. tee is used, area obtained is more than adequate when area of two existing valves is added to it. Code requirements will be met.

If the two existing safeties are the type ordinarily fitted on firetube boilers, I estimate their capacity as about 4500 lb per hr at 125 psig. These two valves can probably be used at 15 psig if manufacturer changes the springs and widens increased lift off seat. Using Napier's equation, each valve's area should be at least 2.18 sq in. to pass one-third the steam generated, or 1500 lb per hr. Ask manufacturer if required effective discharge area can be obtained. New valve must have capacity equal to each of the others.

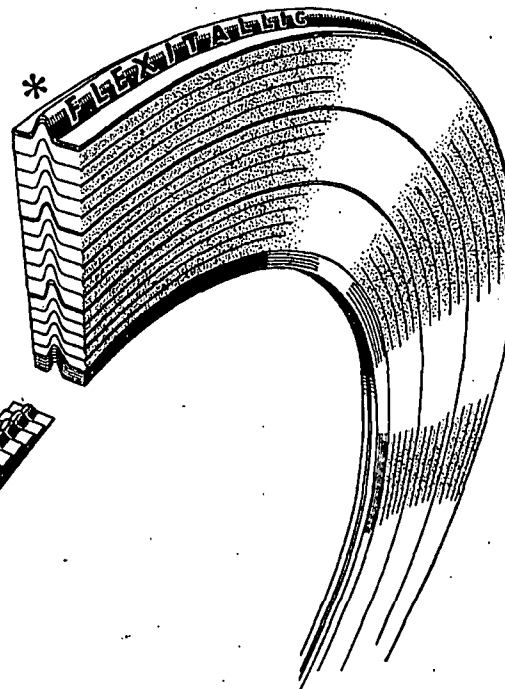
At 16 psig, catalog data show minimum capacity of 3½-in. valve is about 1500 lb per hr. So if existing valve cannot be converted, a new valve with a capacity of 7150 lb per hr is needed. A 6-in. valve on the tee would be suitable.

Computing relieving capacity again. If boilers are reclassified as l-p heating units, we find it is 7250 lb per hr, based on Code requirements. Existing safeties could be replaced with two valves for heating boilers, each rated 4500 lb per hr.

Though LVP may agree with all these suggestions he should consult boiler and valve manufacturers and the local inspector before going ahead.

Change of nonreturn valve depends on whether boiler is reclassified. If it is classified a l-p unit, nonreturn valve should be replaced with gate valve of the outside-screw-and-yoke rising-stem type. I don't think 6-in. nonreturn valve will operate at the 15-psig pressure. See valve manufacturer before taking valve out of the line.

Check pressure-reducing valve to see if it has sufficient capacity to handle heat (Continued on page 210)



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