

Baffles

Baffles serve 2 important purposes on the heat exchanger bundle. They hold the bundle of tubes together in a fixed position, and, they allow for efficient heat transfer by directing the flow of the fluid over the tubes.

Baffle function types can be generally described as baffles for condensing and baffles for liquid flow. Condensing baffles are cut vertically to allow the condensate which collects at the bottom of the shell to flow freely to the drain. Liquid baffles are cut horizontally so that mixing of the fluid is promoted. This avoids inefficient heat transfer due to temperature stratification of the flow.

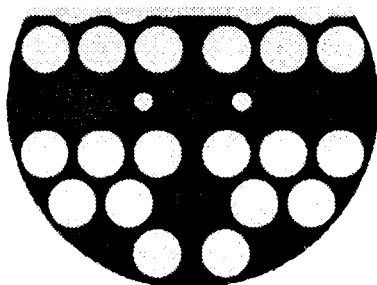
There are 4 common types of baffles used in Armstrong heat exchangers. These are the single segmental, double segmental, disc and doughnut, and condensor types. The single segmental is the most versatile and efficient and is therefore used in all standard Armstrong heat exchangers. Please refer to the literature for a further description of the latter 3 types.

The condensing baffle and liquid baffle are entirely different in their design. For this reason, the two cannot be switched in service. A W or WS bundle cannot be used in a W, WR, WX, or WRX heat exchanger and the same is true for the reverse case.

Liquid baffles are set at the optimum spacing for the specified heat transfer and pressure drop. As the baffle spacing is decreased the shell side velocity increases. This raises both the pressure drop and the heat transfer coefficient. The Armstrong baffle is designed to provide the highest heat transfer efficiency with the lowest pressure drop. Tolerances are maintained at the tightest level in order to reduce losses due to internal fluid bypass. Bypass occurs when the liquid leaks around the bundle or through the tube holes in the baffle rather than flowing across the bundle. The special Armstrong design reduces this leakage.

The Armstrong steam baffle, sometimes called a "spacer" is specially designed for steam condensing. The vertical cut and special shape of this baffle enhances the condensing rate while providing the least amount of resistance to steam flow. This is particularly important at low steam pressures.

THE TWO BAFFLE TYPES CANNOT BE SWITCHED IN SERVICE. THIS REQUIRES THAT A WS BUNDLE BE USED IN A WS SHELL. ALWAYS SPECIFY THE CORRECT BUNDLE AS A REPLACEMENT. WHEN ORDERING A W, WR, WX OR WRX BUNDLE, PLEASE SPECIFY THE REQUIRED BAFFLE SPACING, OR REFER TO THE SERIAL NUMBER OF THE ORIGINAL MODEL.



Beating the Competition

There are as many sales techniques as there are salesmen. They require an entire book --not a page of explanation. When it comes to heat exchangers, there are a few ideas to keep in mind.

Supplying a price and delivery according to specification means the model size is already established. There is not much to do here except assure the price and delivery is a good one. It can't hurt to check the selection on the ACE software --this might be a way to a sale.

The specified model could be wrong for 2 reasons. The competitor may have made a mistake by using the wrong materials or flow conditions. Or he/she may have selected a model without a fouling factor or pressure drop and then added these restrictions to the specification after the fact. Note also that the model selected using 20 gage copper tubes will be different than the size required using 20 gage stainless steel tubes. Use ACE to analyze the competitor's model specified. If it will not perform as promised, the engineer will want to know. He will be very interested if the competitor has forgotten to use the correct materials for the job. The engineer reviewing the competitor's submittal doesn't always catch all the errors.

Delivery may be critical and this may help take the job. The team player organizational structure at Armstrong means you can contact any member of the team about a rush delivery. If the parts are in stock and the shop load is not high, then your order can be personally tracked by a team member. Watch out for B&G "not-a-factory-standard". They are still using fixed bills of material while every model in ACE is an Armstrong standard. This means the Armstrong heater is built using electronic bills of material from CAD assembly drawings. B&G may quote 8 to 12 weeks while the Armstrong model is a standard 4 weeks. Another B&G move is to substitute a standard for a non-standard model. Using the B&G ESP software shows the model to be, for instance, a 6 pass. The specification may show a 4 pass. They 4 pass won't provide the performance promised (usually fouling). Show this to the engineer. He'll be interested.

Some customers want extra information that the competitors are unwilling (or unable) to provide. ASME design calculations, detailed thermal calculations, nozzle loading, nozzle modifications, certified or as-built drawings, inspection and test plans - these items and more are available free of charge. Providing the extra service helps build confidence. A fast delivery of information can also indicate a fast product delivery.

Fouling is the single most abused product selection limit. Adding fouling can add up to 30% more surface area to a vessel. If the competitor specifies it but doesn't use the fouling factor his product is going to cost 30% less and possibly be 30% shorter! Quote the same model, but inform the customer of this. It may be suggested that the software or models can explain the difference. Not true. The heat transfer calculations used by the major players all use the same public-domain correlation's. These will agree to within 10%. When two heat exchangers with the same diameter and bundle length are compared the tube surface areas will agree to within and average 5% plus or minus 2%. This cannot explain a 30% difference -particularly when the competitor's software proves this out! When 0.001 fouling is specified the engineer has to have

Beating the Competition, cont'd

a really good reason for using that much safety factor. If the fluids are so dirty, then he should plan for periodic maintenance or get the fluids treated. If you select based on 0.001 fouling you can just bet the competition will use something less. He/she knows 0.0002 to 0.00045 is adequate (if he is going to cheat then he'll cheat efficiently). The engineer is happy because he's covered himself with a conservative specification but he's not getting the most competitive quote possible. Talk to him about this excessive fouling. He may tie his tie the same way for the past 40 years, but you know he'll jump at the chance to save money. Say something like, "gee I really like your tie, and by the way about this fouling..."

After slaying the fouling dragon, there are all kinds of ways to save your customer money. He can restrict the selection in several ways and you can ease these restrictions to reduce the size. Overall length, tube velocity, (rarely shell velocity), pressure drops and sometimes tube pass quantity. Most often, the tube material will be specified as copper. If these restrictions can be eased in any way, the cost can be reduced.

If you've got the time or a fast computer, then use ACE Uselect Version 5.01 to recommend the smallest heat exchanger. Type in the conditions and press Alt-F the F4 to get a list of possible better sizes. Here is what the program checks:

Tube material. try a better material is so that the size is not limited by the maximum tube velocity.

Tube passes. If the tube passes are fixed to one value, try others. 2, 4 and 6 are available. Note that the more passes, the less surface area.

Overall length. Trying one size longer will provide a heat exchanger 2 diameters smaller. Sometimes this is only 5 inches longer than the competitor's model.

Pressure drop. Increase the allowable by 10% and select again. The resulting size may give only a slightly higher value.

Shell passes. this is new so it rarely shows up in specifications. New? The "bible" of heat transfer written in 1950 by Kern recommends the 2 pass shell for efficient heat transfer. Try this when the LMTD correction factor drops below 85%.

Reverse sides. Steam is commonly placed on the tube side. Try switching sides. The smallest flow should be placed in the shell. Assure the materials are compatible with the fluids.

Baffle spacing. don't let this value throw you. It varies according to the manufacturer. Concentrate on meeting the shell side velocity and pressure drop requirements and ignore the baffle spacing.