~~FLOW ENCHANMENT DEVICES FOR ETHYLENE CRACKING COILS~~

A HEAT EXCHANGE DEVICE AND A METHOD OF MANUFACTURING THE SAME

FIELD OF THE DISCLOSURE

[0001] Embodiments disclosed herein relate generally to the cracking (pyrolysis) of hydrocarbons, and to a heat exchanger and processes for effecting the cracking of the hydrocarbons at higher selectivity and longer run times.

BACKGROUND

[0002] Heat exchangers are used in a variety of applications to heat or cool fluids and/or gases, typically by means of indirect heat transfer through different intervening layers of heat exchange tubes. For example, heat exchangers may be used in air conditioning systems, refrigeration systems, radiators, or other similar systems used for heating or cooling, as well as in processing systems such as geothermal energy production. Heat exchangers are particularly useful in petroleum hydrocarbon processing as a means to facilitate processing reactions using less energy. Delayed cokers, vacuum heaters, and cracking heaters are heat exchange devices commonly used in petroleum hydrocarbon processing.

[0003] Numerous configurations for heat exchangers are known and used in the art. For example, a common configuration for heat exchangers is a shell and tube heat exchanger, which includes a cylindrical shell housing a bundle of parallel pipes. A first fluid passes through the pipes while a second fluid passes through the shell, around the pipes, such that heat exchanges between the two fluids. In some shell and tube configurations, baffles are arranged throughout the shell and around the tubes so that the second fluid flows in a particular direction to optimize heat transfer. Other configurations for heat exchangers include fired heaters, double-pipe, plate, plate-fin, plate-and-frame, spiral, air-cooled, and coil heat exchangers, for example. Embodiments disclosed herein relate generally to heat exchange tubes used within a heat exchange device.

cracked products are then separated into the desired products using various separation or chemical-treatment steps.

[0013] Various byproducts are formed during the cracking process. Among the byproducts formed is coke, which can deposit on the surfaces of the tubes in the furnace. Coking of the radiant coils reduces heat transfer and the efficiency of the cracking process as well as increasing the coil pressure drop. Therefore, periodically, a limit is reached and decoking of the furnace coils is required.

[0014] As decoking causes a disruption in production and thermal cycling of equipment, very long run lengths are desirable. Various methods have been devised to extend radiant coil run lengths. These include chemical additives, coated radiant tubes, mechanical devices that change flow patterns, as well as other methods.

[0015] The mechanical devices or more generally radiant coil flow enhancement devices have been most successful in extending run lengths. These devices increase run length by changing flow patterns to a "desirable flow pattern" in the radiant tube in order to: increase heat transfer rates; reduce the thickness of the stagnant film along the tube wall and thus limiting reactions that cause coking of the tube; and improve the radial temperature profile within the radiant tube.

[0016] However, these devices have a significant drawback. Use of these devices causes an increase in radiant coil pressure drop, which negatively impacts the yield of valuable cracking products. This loss of yield has a significant impact on operating economics and is therefore a significant limitation.

SUMMARY OF THE CLAIMED EMBODIMENTS

[0017] ~~The intent~~Embodiments of the present invention ~~is~~seek to overcome the limitation caused by loss of yield by locating the chosen radiant coil flow enhancement device(s) in a strategic position(s) in the radiant coil. Until now many radiant coil flow enhancement devices have been used throughout the coil or at least in the entire length of one pass of the coil. Others have been specifically located, however, the location has been arbitrary or standard. ~~This~~Embodiments of the present invention seek~~s~~ to locate these devices strategically to maximize their impact and minimize the additional pressure drop created.