temperatures are required as the same reaction heat needs to be provided (for equivalent SM production rates). However, at overall S/O weight ratios of 1.0 or lower, the temperatures needed to provide the required heat may exceed the current metallurgical limitations of the heater coils 38 as well as the associated transfer lines.

SUMMARY OF THE DISCLOSURE

[0008] It has been found that using only a portion of the EB/SM splitter overheads to provide heat to the azeotropic vaporizer may provide for realization of the full benefit of heat recovery from the EB/SM splitter overheads, as well as sufficient process flexibility so as to operate the dehydrogenation reaction zone over a wide range of overall steam to oil weight ratios, including overall steam to oil weight ratios of less than 1.0. The benefits of embodiments disclosed herein may be realized without reducing the Main Steam to Oil weight ratio, thus providing for the necessary reactor effluent reheat capacity.

[0009] In one aspect, there is provided~~embodiments disclosed herein relate to~~ a process for the dehydrogenation of an alkylaromatic hydrocarbon, the process comprising~~including~~: contacting a reactant vapor stream, comprising an alkylaromatic hydrocarbon and steam and having a first steam to alkylaromatic hydrocarbon weight ratio, with a dehydrogenation catalyst in a reaction zone comprising one or more reactors under dehydrogenation conditions so as to form a vapor phase effluent comprising a product hydrocarbon, the steam, and unreacted alkylaromatic hydrocarbon; feeding at least a portion of the effluent to a splitter to separate the product hydrocarbon from the unreacted alkylaromatic hydrocarbon; recovering the unreacted alkylaromatic hydrocarbon from the splitter as an overheads fraction; recovering the product hydrocarbon from the splitter as a bottoms fraction; recovering heat from a first portion of said overheads fraction by indirect heat exchange with a mixture comprising alkylaromatic hydrocarbon and water to at least partially condense said portion and to form an azeotropic vaporization product comprising alkylaromatic vapor and steam and having a second steam to alkylaromatic hydrocarbon weight ratio; combining the azeotropic vaporization product with additional alkylaromatic hydrocarbon and additional steam, together or separately, to form the reactant vapor stream.

[0010] Other embodiments~~aspects~~ and advantages will be apparent from the following description and the appended claims.