pressure, This imposes limits on the use of equipment, such as fans, to effectively circulate fluids, such as a fluid that contains acetic acid and/or anhydride as described in WO 2009/095687. These have a relatively short service life, which results in a costly operation.

Further, it is desired to effectively remove acetylation medium from the wood. The general method to accomplish this is by stripping the reactor with a stripping gas, which is allowed to condensate, as a result of which liquid chemicals can be retrieved. An issue with this removal (chemical recovery) is the high energy input required.

A background reference is US 5,525,721. Herein wood is acetylated by applying acetylation fluid exclusively in a vapour phase. The method is applicable for wood fibers and wood strips having a relatively large surface area to volume ratio. The method, and apparatus described, does not lend itself to acetylating solid wood, particularly not of solid wood in the form of e.g. beams or planks having relatively large dimensions. The reference does not address chemical recovery.

Summary ~~of the Invention~~

In order to better address one or more of the foregoing desires, the ~~invention~~ disclosure presents~~, in one aspect,~~ the use of a reactor system for the acetylation of lignocellulosic materials, the system comprising a reaction vessel having a closable aperture suitable for the introduction of lignocellulosic material, a liquid-inlet and/or liquid-outlet for acetylation fluid, and a gas-inlet and gas-outlet connected to a first gas flow loop, said first gas flow loop comprising a gas flow line connecting the gas-inlet and the gas-outlet, said gas flow line connected to a heat exchanger and at least one fan, the use being for an acetylation process wherein solid wood is submerged into a liquid acetylation medium.

In ~~another~~ a first aspect, the ~~invention~~ disclosure provides a reactor system for the acetylation of lignocellulosic materials, the system comprising a reaction vessel having a closable aperture suitable for the introduction of lignocellulosic material, a vacuum connection suitable for creating vacuum in the reaction vessel, a liquid-inlet and/or liquid-outlet for acetylation fluid, and a gas-inlet and gas-outlet connected to a first gas flow loop, said first gas flow loop comprising a gas flow line connecting the gas-inlet and the gas-outlet, said gas flow line connected to a heat exchanger and at least one fan, wherein the inlet and the outlet of the first gas flow loop are positioned such as to allow gas circulation over the diameter of the reaction vessel.

In ~~a further~~another aspect, the disclosure ~~invention~~ provides a process for the acetylation of lignocellulosic material, comprising introducing the lignocellulosic material into a reaction vessel as defined above, filling the reaction vessel with acetylation fluid so as to submerge the lignocellulosic material; allowing the lignocellulosic material to become impregnated with acetylation fluid; removing excess acetylation liquid, applying heat to the impregnated lignocellulosic material by circulating heated gas through the reactor via said first gas flow loop and, where applicable, via said further gas flow loops, so as to allow acetylation of the lignocellulosic material to occur.

In yet another aspect, the disclosure ~~invention~~ relates to a process for the acetylation of lignocellulosic material, comprising the steps of (a) impregnating the lignocellulosic material with an acetylation fluid and removing the excess acetylation liquid; (b) heating the impregnated lignocellulosic material by means of a flow of heated gas so as to allow acetylation of the lignocellulosic material to occur; (c) lowering the pressure to which the lignocellulosic material is subjected so as to allow residual acetylation fluid to migrate out of the lignocellulosic material; (d) allowing gas to act as a stripping gas for the migrated residual acetylation fluid by subjecting such gas to condensation; wherein the gas subjected to condensation is a portion of the circulating heated gas flow.

In a further aspect, the disclosure relates to the use of a reactor system to conduct a process for the acetylation of lignocellulosic materials, the reactor system comprising a reaction vessel having a closable aperture suitable for the introduction of lignocellulosic material, an inlet and outlet for acetylation fluid, and an inlet and outlet connected to a first gas flow loop, said first gas flow loop comprising a gas flow line connecting the inlet and the outlet, said gas flow line connected to a heat exchanger and at least one fan, the use being for an acetylation process wherein solid wood is submerged into a liquid acetylation medium.