that overcomes the disadvantages of those processes known in the art. In particular, a process was to be provided which has an improved energy demand, in particular compared to processes where MSA is delivered as a liquid side-discharge. Furthermore, a process should be provided which allows a variation of the feed with regard to side-products such as sulfuric acid, SO_3 or MMS and which also could handle generation of side-products due to thermal degradation during the separation process itself, leading to the desired product specifications.

The problem is solved by the features of the independent claims. Preferred embodiments of the present invention are provided by the dependent claims.

In one aspect, the disclosure relates to a process for separating anhydrous methanesulfonic acid from a reaction mixture comprising methanesulfonic acid and sulfuric acid by distillation with at least three functional steps, characterized that in the first functional step the reaction mixture is fed into a first column K1, where the top stream of column K1 is then transferred to the second functional step, wherein this second functional step is a second column K2, in which purified anhydrous methanesulfonic acid is obtained from its bottom stream, and wherein the bottom stream of column K1 is transferred to a third functional step, wherein this third functional step is either a third column K3 or an evaporator W3-1, in which the top stream is recycled back into column K1, and in which the bottom stream is separated from the distillation process.

The term "anhydrous methanesulfonic acid" in this inventive process refers to an anhydrous MSA quality as commonly available on the market, i.e. it may still contain traces of water, e.g. less than 0.5 wt-%, or more common less than 0.2 wt-%, less than 0.1 wt-% or less than 0.05 wt-%.

A further preferred embodiment relates to a process, in which in addition to an evaporator W3-1 further (n-1) evaporators W3-2, W3-3, … , W3-n, n being an integer from 2 to 10, are used in the third functional step, wherein the bottom stream of each evaporator W3-k, k being an integer from 1 to (n-1)) is transferred to each evaporator W3-(k+1), and wherein the top stream of each evaporator W3-(k+1) is transferred back to each evaporator W3-k, while the bottom stream of evaporator W3-n is separated from the distillation process.
Another embodiment relates to a process, in which the third functional distillation step is realized with a combination of a column K3 and one or several evaporators W 3-1, W3-2 ... in series.

Another preferred embodiment relates to the inventive process, wherein the reaction mixture comprises 55 to 95 wt.-% methanesulfonic acid, 5 to 45 wt.-% sulfuric acid, 0 to 5 wt.-% methanesulfonic acid anhydride, 0 to 1 wt.-% side products, 0 to 5% SO_3, 0 to 5 wt.-% of water and traces of methane, wherein the sum of all components sums up to 100 wt.-%, and wherein the