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Evaluation of the Viability of Dehydrating the Beer
using Calcium Oxide for Economical Production of
Ethanol

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ABSTRACT

The current conventional fermentation processes can yield mash with ethanol content of 12% at maximum. Evaluation of the energy required to distill such a beer gives a high value than if the concentration is increased in the beer. Much as it is possible to increase the ethanol concentration in the beer before distillation by using a number of approaches such as; differential solubility, differential miscibility, absorption method, drying with lime, azeotropic distillation and zeolites molecular sieves, there are no reported studies about the economic significance of such approaches. It was against such background that this study sought to evaluate the effects of mash dehydration using calcium oxide on the economical production of ethanol. Thus the study was guided by the following objectives: to determine the maximum limit to which the beer can be concentrated using calcium oxide; To determine the effect of dehydrating the beer on energy requirements for distillation and; To determine ranges of beer and distillate concentration within which it is economical and energy efficient to carryout ethanol dehydration using calcium oxide. The above stated objectives were mainly achieved by using experiments herein discussed, where the data source is basically primary and the data types of quantitative nature. The study concluded that; there is a limit of dehydrating the beer with CaO. This limit is reached when volume of CaO is 90% the volume of beer. Increasing the volume of CaO above this limit results in complete absorption of the mash i.e., the mash just wets the CaO. The study further concluded that the energy for distillation for the samples that were dehydrated using CaO reduced significantly compared to those that were not; though when the ethanol concentration in the mash reaches 30%, the effect of dehydrating the beer on distillation is no longer significant. Thus, excessive use of CaO has no effect on the energy for distillation. Additionally, much as the distillation energy is reduced after dehydrating the beer with CaO, the overall process energy increased. Therefore, it is economical and energy efficient if the dehydration process using CaO is eliminated. The study recommended that excessive volumes of CaO should not be used

for dehydrating a given quantity of beer since it is all absorbed by the CaO. It further recommended that unless means are devised for preparing the CaO with as little energy as possible, it is not possible to commercially apply this production process as it will be more energy intensive and expensive compared to the conventional distillation process followed by upper end dehydration, thus this approach should be avoided however much dehydrating the beer with CaO decreases the energy for distillation to some extent.