



ซ้ำของขวดที่ไม่ได้คุณภาพลงได้ 1,382,400 ขวดต่อปี และลดค่าใช้จ่ายของสารเคมีและพลังงานที่ใช้  
ในกระบวนการล้างขวด คิดเป็นมูลค่า 326,185 บาทต่อปี



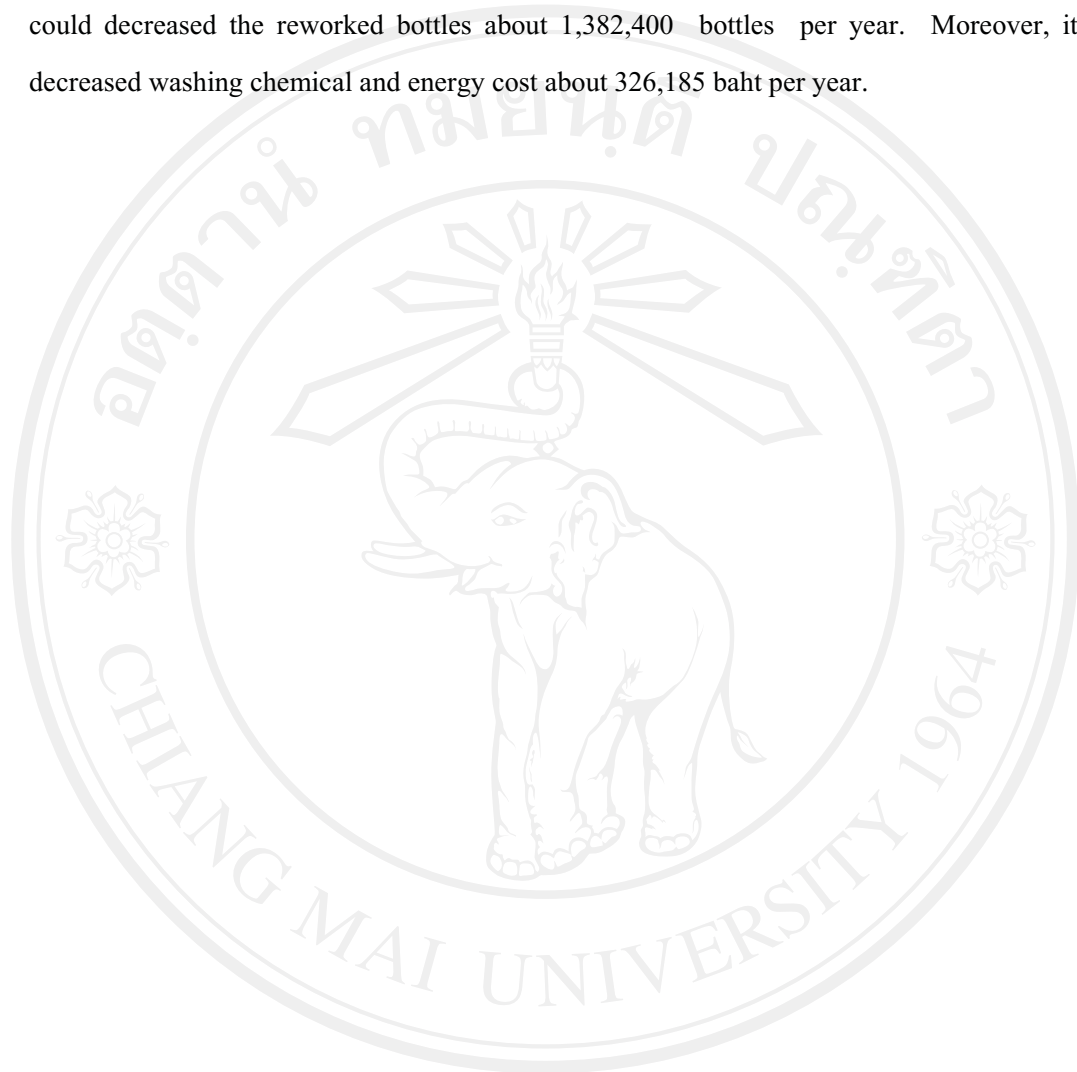
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| <b>Independent Study Title</b>   | Optimal Conditions for Washing Used Glass Bottles<br>by Automatic Washing Machine in Carbonated<br>Water Factory |
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### ABSTRACT

This independent study aimed to study the optimal condition for washing used glass bottles by automatic washing machine in carbonated water factory, Chiang Mai Beverage Company Limited. The conventional factorial washing condition consisted of 2.5% w/v sodium hydroxide solution, 0.6% w/v “Stabilon” (glossy reagent) and controlled temperature at 90 °C. From the study of optimal condition by using 2<sup>3</sup> Factorial Experiment in Central Composite Design, it provided 17 washing conditions. After that, each washing conditions was applied to clean used glass bottles by using laboratory scale washing equipment. Six qualities of washed bottles were conducted: percent of clean bottle, percent of bottle which pass the glossy surface standard, percent of bottle without sodium hydroxide solution residue, percent of bottle without glossy reagent residue, percent of bottle which pass pH standard and percent of bottle which pass microbiological standard. The Design Expert 6.0 program was used to analyze the optimal washing conditions, it was found that there were two similar washing conditions. In the study, the average of both washing conditions was selected which consisted of 2.74% w/v sodium hydroxide solution, 0.4% w/v glossy reagent and controlled temperature at 86 °C. This selected washing condition was applied to clean used glass bottles by using the automatic washing machine, it was found that all washed bottle qualities were similar to

predicted qualities by Design Expert 6.0 program. Optimal washing condition provided better washed bottle qualities than conventional washing condition. This investigated washing condition could decreased the reworked bottles about 1,382,400 bottles per year. Moreover, it also decreased washing chemical and energy cost about 326,185 baht per year.



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