Study of vulcanized Jatropha curcas oil synthesize and reactor perfomance on semi pilot scale

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Abstracts

Vulcanized vegetable oil are generally known as brown factice. Vulcanized vegetable oil has a rubbery texture. The main function of vulcanized vegetable oil is as rubber processing aids to promote rubber compounding. By addition of vulcanized vegetable oil on rubber compounding cause rubber easily mixed with its chemicals, shorten mixing time, and minimize compounding energy. World vulcanized vegetable oil consumption increase significantly but the producers is limited only on East Asia and Europe. So it needs to be studied the establishment of vulcanized vegetable oil plant in Indonesia. The research aims to study of vulcanized jatropha curcas oil synthesize and reactor performance on semi pilot scale. Semi pilot scale is one of the stages in commercial-scale plant. The vulcanized vegetable oil was synthesize from Jatropha curcas oil on semi pilot scale reactor capacity 1 kg oil/batch. Concentration of Na$_2$CO$_3$ and ZnO were varied at 0.25 and 0.50 pho. The reactor was run at 140°C and 100 rpm. The reaction condition and vulcanized vegetable oil characteristics were observed to determined the optimum condition of the reactor. The result showed that the best vulcanized vegetable oil obtained from 0.50 pho Na$_2$CO$_3$ and 0.50 pho ZnO, 105 minutes time of reaction, and 177°C highest exothermic temperature of reaction. This vulcanized vegetable oil has specification similar with commercial vulcanized vegetable oil. Thus the synthesize of vulcanized vegetable oil on semi pilot scale feasible to be developed on a commercial scale.

Keywords: Brown factice, jatropha curcas oil

Introduction

Vulcanized vegetable oil are generally known as brown Factice (Hepburn, 1997). Brown factice also formerly called rubber substitute (Chandrasekaran, 2010) because it has rubbery texture (Nagdi, 1993). The main function of vulcanized vegetable oil is as rubber processing aid (Simpson, 2002). Processing aids are the chemicals compound used to increase the ease of mixing by increasing the rate of filler dispersion and reducing power consumption in mixing operations without adversely affecting the other properties of the compound (Gupta, 1998).

The oils from which vulcanized vegetable oil are manufactured are unsaturated vegetable oils which react with sulphur. Fatty oils with iodine number greater than 80 are generally used (Simpsons, 2002). for example rapeseed oil or linsseed oil (Whelan, 1994). Other oils are used in preference by other countries due to local availability and cost Other oils are used in preference by other countries due to local availability and cost (Simpson, 2002). Depending on the level of unsaturation in the oils the loading of sulphur is between 10% and 20% by weight (Methven, 1990). Other ingredients are added to vulcanized vegetable oils such neutralization agent (Na$_2$CO$_3$), activator (ZnO) and accelerator (ZDEC). Na$_2$CO$_3$ is also necessary in the formation of the porous texture of vulcanized vegetable oil.

World vulcanized vegetable oil consumption increase significantly but the producers is limited only on East Asia and Europe. The main countries of vulcanized vegetable oil producers are Japan, China, India, Germany, and Netherlands. In Indonesia, increased consumption of imported vulcanized vegetable oil is effected by rubber hose industries development. Vulcanized vegetable oil has a number of uses in rubber compounds where it can stabilize dimension of products such hose and tubing during early stage of heating of the vulcanization cycle (Simpson, 2002). So it needs to be studied the establishment of commercial vulcanized vegetable oil plant in Indonesia in order to substitute imported into the local vulcanized vegetable oil gradually.

Laboratory and semi pilot scale are early stages in commercial-scale plant establishment. Laboratory scale experiment of vulcanized vegetable oil synthesize has been done several years ago using various type of vegetable oils in Bogor Research Center for Rubber Technology. The vegetable oils used in the experiment can be classified into edible and non edible oils. The result showed that vulcanized vegetable oil from edible oil relatively has better quality than vulcanized vegetable oil from non edible oils. But the application constrained on food supply.