CHAPTER VI

CONCLUSIONS

6.1 CONCLUSIONS

Sustainable development requires methods and tools to measure and compare the environmental impacts of human activities for the provision of goods and services. Environmental impacts include those from emissions into the environment and through the consumption of resources, as well as other interventions associated with providing products that occur when extracting resources, producing materials, manufacturing the products, during consumption/use, and at the products' end-of-life. These emissions and consumptions contribute to a wide range of impacts. Practitioners and researchers from many domains come together in life cycle assessment (LCA) to calculate indicators of the aforementioned potential environmental impacts that are linked to products.

This research, then, Life Cycle Assessment (LCA) was used to evaluate the environmental impact associated with manufacturing of two type of wood-plastic composite which prepared from poly(vinyl chloride) and polypropylene composite with sawdust using SimaPro® 6.0 software as software tool with Eco-indicator 95 and Eco-indicator 99 method for evaluate the environmental impacts of two wood plastic composites. Life cycle inventories (LCI) are successfully generated for all two products.

Life cycle impact assessment (LCIA) of the two WPC has been performed by using Eco-Indicator 95 and Eco-Indicator 99 provided in SimaPro ® 6.0 software. The results obtained from the LCA study on the WPC-PP/Sawdust production show that the major environmental impacts are in acidification, green house gas and heavy metal effect. Damage assessment shows that the damages are mainly on human health and resource depletion which resulted from impact categories such as, respiration of inorganic substances, ozone layer depletion effect and depletion of fossil fuels. By conducting LCA throughout 3 phase of WPC-PP/Sawdust production, the results

indicate that the material preparation and manufacturing phase contribute mainly to environmental impacts. For material preparation phase, the environmental impacts mainly come from polypropylene which effect to human health and ecosystem quality.

For production of WPC-PVC/Sawdust, the environmental impacts are high in the following categories: acidification, green house gas and heavy metal effect, respectively. The damage assessment indicated that damages are mostly occurring on human health and resource depletion. Among the 3 phases in WPC-PVC/Sawdust production, material preparation and manufacturing phase are the main contributors to the environmental impact. For material preparation phase, the environmental impacts mainly come from polypropylene which effect to human health and resource depletion. Moreover, from the comparison of the environmental impacts of two WPC, WPC-PP/Sawdust and WPC-PVC/Sawdust, it was found out that environmental impacts of WPC-PVC/Sawdust production is higher than the impacts caused from the production of WPC-PP/Sawdust because using poly(vinyl chloride) as polymer resin is effecting to environment higher than using polypropylene as resin and, also because WPC-PVC/Sawdust using more additive substance than WPC-PP/Sawdust. The total single score of environmental impacts of WPC-PVC/Sawdust are approximately 1.3 times higher than that of WPC-PP/Sawdust. If the production, therefore, is more concern in environmental impacts, the wood – plastic composite should be produce from polypropylene because it has lower environmental impacts than using poly (vinyl chloride)

In economic performance, the break even point, the point at which cost and income are equal, for WPC-PP/Sawdust and WPC-PVC/Sawdust production are equal to 38,670 and 20,465 kg WPC respectively. In addition, the gross profit per year (the difference between revenue and the cost of the making product) for WPC-PP/Sawdust and WPC-PVC/Sawdust production are equal to 9,042,850 and 17,089,985 baht per year respectively but these gross profit are not included direct labor and all of variable manufacturing costs. Then, the actual gross profit and net income should be considerate again. From consideration in economic performance, then the production of WPC should be produced from poly (vinyl chloride) since it has the lower cost

which leads to the higher gross profit and net income than using polypropylene as polymer resin.

6.2 RECOMMENDATIONS

6.2.1 A good set of inventory data should be developed because database is the most important factor for assessment of environmental impacts from product life cycle; therefore, the up-to-date and good qualities of data are very crucial.

6.2.2 The inventory database of Thailand which contains basic materials, basic utilities, and etc. should be also developed in order to assess more effective environmental load of Thailand.

6.2.3 After quantifying environmental impact by LCA method, the other environmental management such as cleaner technology (CT), pollution prevention, eco-design and etc. should be applied for reduces environmental impacts