CHAPTER VI

DISCUSSION AND CONCLUSION

According to overview of each chapter, the most important conclusion of this research is pointed out. Finally, possible development thermal insulation is applicable for exterior wall panels of low-incomers.

6.1 Discussion

Apparatus

Apparatus as described in Chapter III was designed based on the previous literatures of similar or involving researches. Experimental process and result obtained in Chapter IV show that the test method in this research can be considered reliable. According to literatures reviewed, experimental procedure and results, the visible dimension of metering cells size 1.0 m x 1.0 m x 0.6 m is sufficient for experiment. However, thickness of walls of apparatus was 10 cm of EPS, which thermal resistance of 2.82 $^{o}C \cdot m^2/W$ is slightly higher than some test specimens. Thus, heat may lose though walls of all the metering cells may occur during the experiments.

Cost

Obtaining all sizes of particles from packaging EPS foam are not expensive, except the smallest size (0.1-3mm) which were obtained by using papaya shredder. The costs of obtaining those particles are in between 174 THB/m^3 and 637 THB/m^3 while the smallest size costs as high as 2,050 THB/m^3 compared to solid panel EPS cost around 2,200 THB/m^3. In contrast, obtaining particles by hand picking for the larger size (chunks) was faster process, and thus, low cost of production.

Filling EPS Particles and Chunks into the Wall Systems

It was found that there was no difficulty with filling small EPS particles into the cavity of the wall systems. However, when filling the cavity with the mix containing EPS chunks, segregation of different size EPS occurred. This is due to the chunks were nearly as large as the width of the cavity.

Thermal Resistant Performances

The results in Chapter 4 showed that specimens composed of smaller size of EPS particles had higher thermal resistance. Thermal resistances of specimens with larger EPS particles were not high due to more air voids occurred between particles. Mixes of EPS chunks and EPS particles had lower resistance to heat can be a result of the mixing ratios were not right, i.e. EPS particles were not enough to fill all the voids. However, even the right mix was found, it was still difficult to fill because the chunks were so large when compared with the cavity. The mixed particles Size 0.1-15 has thermal resistance of about 2.36 $^{o}C \cdot m^2/W$. According to ORNL (2002) and Rasisutta & Haberl (2004), thermal resistance of particles Size 0.1-15 performs well enough for exterior wall in hot and humid climate.

6.2 Conclusion

The most convenient thermal insulation, which is easy to obtain and apply in 10 cm wide of cavity wall systems at low cost of labor (300 THB/m^3) with relative high thermal resistance (about 2.36 $^{o}C \cdot m^2/W$) was the EPS particles Size 0.1-15 mm obtained from scratching by nail pads.

Suggestions

1. Packaging EPS foam may be scratched and compressed so that it can give higher R-value.

2. The apparatus here can be used to approximate R-values of other insulating materials through comparative experiments.

3. The hot box used in this research is not expensive when compared with other tools to test for thermal resistance of materials. Though it does not yield R-value directly it can still give R-value by comparison with some pre-known materials. This tool should be further developed.

Recommendations

1. Chunks and Particles Mixes should be a further research to find the best proportion of the mixing.

2. There should be a research to narrow down the size of test specimen and hot box test.

3. Hot box test in this study can be a reference for many researches to develop it to be a standard one.

4. A machine to break down packaging EPS foam should be researched. It will improve the cost.