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Solar Thermal Technology Acceptance among Small Medium Enterprises (SME) in Six District Council in Selangor Malaysia

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Abstract

In this study, solar thermal technology acceptances among SME in Selangor Malaysia were investigated. The acceptance was measured through the questionnaire distributed in six district councils in Selangor. The data obtained were statistically analysed. Only 15 companies volunteer to answer the survey and were classified into three categories: food and beverages, textile, and others. The results revealed that the SME industries in Selangor are not willing to adopt the solar thermal technology as the survey data has shown that 39% of respondent were willing to implement the solar thermal system, 57% in indecision situation, and 4% of the respondent were reluctant to install the solar thermal system. It concludes that the SMEs are unwilling to install solar thermal technology in their process activities. This article contributes to the policymaker to a successful solar thermal policy for SMEs process industries in Malaysia.

Keywords: Solar Thermal Technology, SME, District Council

Introduction

Solar thermal technology is a technology of harnessing thermal energy from solar energy. The simplest solar thermal system comprises of two components: thermal collector and storage tank. It works by collecting the heat energy from the sun and transfers the heat to the fluid in the collector, transport it to storage tank, release the heat, and flow back to the collector for reheating. Solar thermal technology is the best known for reliable, low maintenance renewable energy technology, and carbon savings (McConnell, 2010.). The practical solar thermal system consists of solar thermal collector, pump and controller, and storage tank. Heating is the most needed process in SME industry such as dairy, drying, and other processes (McConnell, 2010; Baharom and Dahlan, 2017; Bujang et al., 2016; Hudson et al., 2019). Statistic shown by Malaysia Energy Information Hub (MEIH) by Malaysia Energy Commission,

final energy demand by the industry in Malaysia in 2016 is 16,019 Ktoe and 17,463 Ktoe in 2017. It shows the increase in energy demand. As mentioned by (Epp, 2016), by 2025, solar thermal deployment target by the industry is estimated to be 350 MWth. per annum. Solar thermal collector areas deployment are predicted to be 1,341,429 m2 and 763 kilotons of CO2 emission reduction of Greenhouse Gas (GHG) emission (Epp, 2016).

At present, green technology achievement in policies under Green Technology Master Plan (GTMP) are National Renewable Energy Policy and Action Plan (NREPAP), Renewable Energy Act (REA), National Climate Change Policy (NCCP) and National Automotive Policy (NAP). The CO2 reduction targets do exists in 21st Conference of Parties (COP21), National Energy Efficiency Action Plan (NEEAP), (NREPAP). (Epp, 2016) also stated that the proportion of GHG reduction target for solar thermal deployment in each policy or action plans are to be 0.19% , 5.20%, 167.4%, and 8.33% for COP21, NREPAP Malaysia (Renewable Energy 2025), NREPAP Malaysia (Solar PV-2025), and NEEAP (2016-2025) respectively (C. Fitzgerald *et al,* 2019), (William, 2015), (Federation, 2007; Bekhet, 2016).

The author of (Epp, 2016) has stated that several keys of the solar thermal technology deployment in the industry are economic, environmental, and social. The outputs for these keys as reported by (Agency, 2014) are RM 1.54 billion of financial investment, 3.8% of energy saving from the industrial energy consumption, and 1.4% reduction of fuel subsidy. These outputs are based on the solar thermal lowest of CO2 avoided cost – RM 0.34/kg-CO2. The jobs creation from the solar thermal deployment (manufacturing, installation, design and plants maintenance) is estimated to be 6,120 jobs.

Therefore, it is important to collect data from the end-user (SMEs) in order to study the solar thermal acceptance. In this study, six district councils in Selangor were chosen as Selangor has lots of SMEs industry. For the purpose of this descriptive study the SME willingness to implement the technology in the company was chosen as one of the acceptance criteria. Further discussion will be on the policy failure, SME in Selangor, methodology, results (findings), conclusion and recommendation.

Policy Failure

The author of (Lian, 2018) identifies that the policy success is mainly depending on the good decision from the end-user interest as highlighted in the framework for understanding the quality of policy, (UNIDO, MAESCO, 2019)claims that the behaviour of the interested parties does contribute the interacting factors policy failure. Mc Connell in his paper (Ministry of Energy, 2019) has concluded that the program for policy is considered a success when it can create benefits for a target group which in our situation will be SMEs process heating industry. Together with these studies also provide important insights into the end-user interest on solar thermal technology.

SME in Selangor

In Malaysia SME Industries has been classified into two main categories: Manufacturing and services and other sectors. Small manufacturing enterprises' number of employees is in between 5 to 74 people meanwhile for medium enterprise is in between 75 to 200 employees. The services and other sectors categories, the number of employees for small enterprises is in between 5 to 30, and medium is in between 30 to 75 people.

Figure 1 shows the total number of SMEs established in Malaysia as established by Department of Statistics Malaysia (DOSM) in 2016. Selangor has the biggest SMEs industries (179,271) compared to other states in Malaysia.

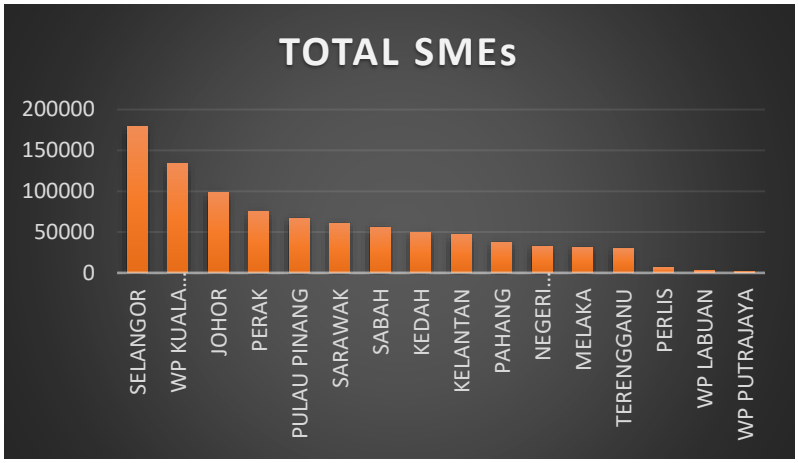

Figure 1: Total SMEs in Malaysia. Source: DOSM 2016

Methodology

Contradict to the work done by (Kardooni *et al*., 2016), this study is set more than 100 sets of questionnaires and randomly distributed to SMEs in six districts in Selangor. Conceptual framework for acquiring the technology acceptance is inspired by the research conducted by (Jaafar, 2015). Research model used for this research is shown in Figure 2. In the first phase, the SME owners were approached and required to answer the questionnaire. Only 90 (mostly from small enterprises) out of 100 per cent of SMEs owners were volunteered to participate. The questionnaires were divided into three main sections: section A is the general technology acceptance, section B is the manpower, and section C is the financial. The objectives of having these sections are to identify the SMEs acceptance, skill manpower, and financial expectation for solar thermal investment purposes. The owner of the SME industry was briefed before answering the questionnaire. Only the SME willingness to implement the solar thermal technology in the company is discussed and analysed in this study. The system dynamics simulation being used as Vensim software is a kind of visual modelling tool in analysing the data.

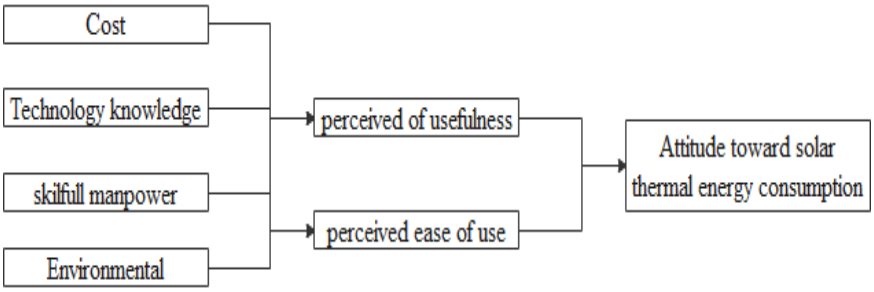

Figure 2: Research model

Finding

Selangor has 12 district councils: Shah Alam District council known as Majlis Bandaraya Shah Alam (MBSA), Majlis Bandaraya Petaling Jaya (MBPJ), Majlis Perbandaran Subang Jaya (MPSJ), Majlis Perbandaran Kajang (MPKJ), Majlis Perbandaran Selayang (MPS), Majlis Perbandaran Klang (MPK), Majlis Perbandaran Ampang Jaya (MPAJ), Majlis Perbandaran Sepang (MP Sepang), Majlis Daerah Kuala Selangor (MDKS), Majlis Daerah Sabak Bernam (MDSB), Majlis Daerah Hulu Selangor (MDHS), and Majlis Daerah Kuala Langat (MDKL). As being discussed in earlier section, the participants were only the owner of the SMEs company from six district councils. The chosen district councils are MDSB, MDHS, MDKL, MDKS, MPKJ, and MPK.

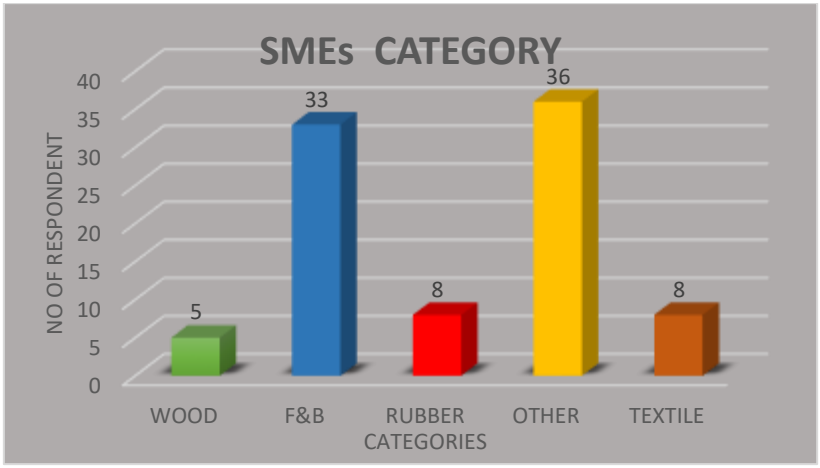

Figure 3: SMEs respondent by categories

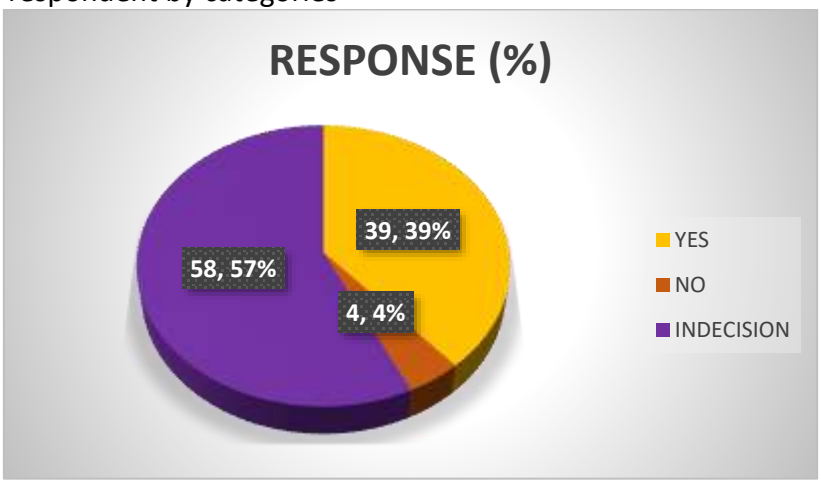

Figure 4: SMEs willingness to implement solar thermal technology in the company

Figure 3 shows the number of SMEs respondent based on the five categories: wood, food and beverages, rubber, textile and others. Meanwhile, Figure 4 represents the percentage of the survey responses. In total, only 39% of SMEs are willing to deploy solar thermal technology in their production activities. Other than that, 57% respondents are in indecision situation. It shows that to achieve the deployment target as per Solar Thermal Roadmap for Industries report, some actions are needed to be taken to influence the SMEs decision for implementing solar thermal technology. By implementing awareness programmes or monetary incentives, it will help the 39% of SMEs indecision owner agree to implement solar thermal technology in their company. Therefore, the target set by Malaysian Government will easily achieve because only 4% of SMEs rejected the idea of implementing the solar thermal technology.

Table 1
Response of willingness to implement solar technology in the company.

District Council	Response		
	Yes (%)	No	Indecision
Sabak Bernam (MDSB)	47	13	40
Kuala Selangor (MDKS)	13.33	6.67	80
Klang (MPK)	33.33	6.67	60
Kajang (MPKJ)	40	0	60
Hulu Selangor (MDHS)	47	0	53
Kuala Langat (MDKL)	53	0	47

Table 1 shows detail response of willingness to implement solar technology of SMEs for six district councils. There are two district councils, MDKL (53%) and MDHS (47%) have positive response toward solar thermal technology by choosing 'Yes' and 0% for 'No' criteria in answering the question on willingness for solar thermal technology implementation in the company. MDSB results have shown that the SMEs still reluctant to adopt the solar thermal technology. The evidence for this was provided by the 'No' percentage of response as shown in the Table 1. The MDSB responses showed that 13% of the SMEs participants rejected the technology and 40% are in indecision condition. However, the percentage value obtained for MPKJ show a significant difference with the percentage obtained by MDKL and MDHS. MPKJ has shown less interest toward the technology. Similar trends have been observed from the Table 1, where MPK (33.33%) and MDKS (13.33%) show less interest on the solar thermal technology implementation.

Overall, the results show that the SMEs are still in a 'wait and see situation' where the majority of the participants are indecision as analysed by Figure 4.

Conclusion and Recommendation

In general, this study is to achieve its objective to study the SME willingness in Selangor to install solar thermal technology for its process activities. However, there are limitations that were encountered where majority of the process SMEs are in indecision condition. Due to this limitation, the suggestions for the Selangor state government is to develop awareness programs and solar thermal installation incentives for SMEs industry. These actions could reduce the indecision percentage among SMEs and achieve the deployment target in 2025 as per outlined in Solar Thermal Technology roadmap for Malaysian Industries. As highlighted by [16], Malaysian government can reduce or introduce a better regulation on administrative barrier for roof installation by the SME owners. No limited to that, Malaysian government also should revise or introduce Malaysian solar obligation on solar energy sharing for heating demand produced by solar thermal technology.

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