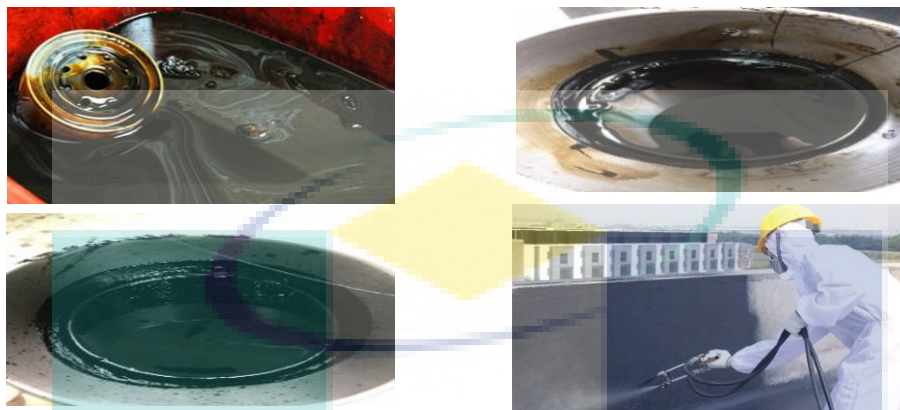


TEMPLATE
BUKU PROFIL PENYELIDIKAN SKIM GERAN PENYELIDIKAN
GERAN UNIVERSITI JANGKA PENDEK / GERAN DALAM UMP



TITLE OF RESEARCH
RHEOLOGICAL AND STRUCTURAL CHARACTERIZATION OF
EMULSIFIED MODIFICATION BITUMEN SYNTHESIZED FROM
INDUSTRIAL WASTE (RDU160129)

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ABSTRACT (120 words)

The cooler surface temperature than surrounding air may result in condensation which will propagate the growth of mould and fungi. The operation theatre has to maintain the temperature lower than the ambient condition which may result in condensation and lead to fungi problems. The aim of this study is to eradicate the fungi problems through coating and insulation by formulating Emulsified Modified Bitumen (EMB) from industrial waste. The industrial grade bitumen (60/70) will be modified with recycle used oil and mix with three different types of emulsifier. Industrial waste such as recycle used oil was being used to reduce the usage of raw bitumen in the formulation of EMB and also to reduce the excessive environmental issue in Malaysia.

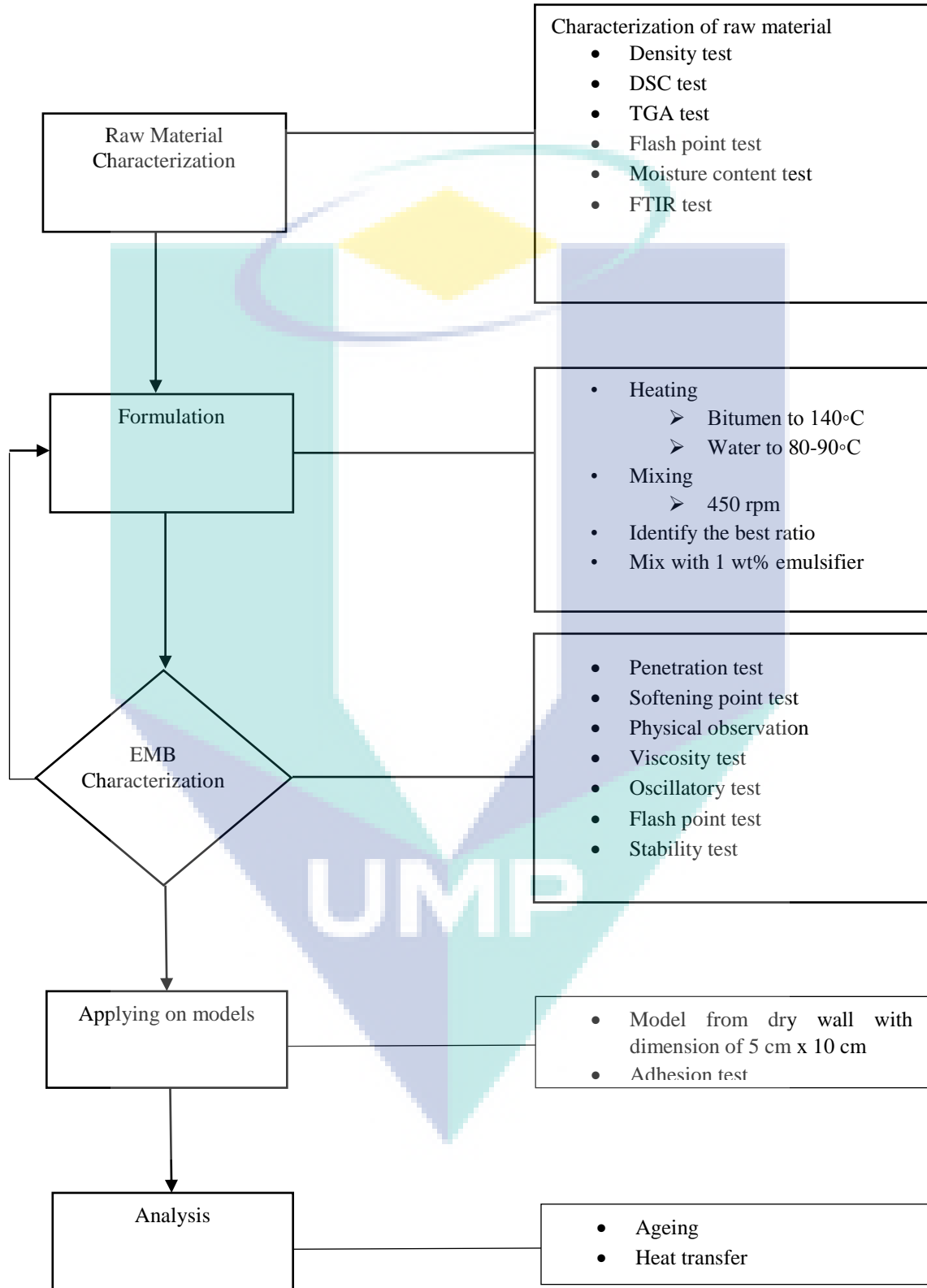
1. INTRODUCTION

Emulsified Bitumen (EB) is a mixture of water and bitumen. Ironically, water and bitumen cannot be mixed as bitumen is an oil based product from the fractional distillation process of crude oil. So, the addition of emulsifier into the water facilitates the breaking of bitumen into smaller particles and allowing the dispersion of bitumen in the liquid suspension (Arab, D., Kantzas, A., & Bryant, S. L., 2018). Therefore, EB is a combination of water, emulsifier and bitumen. In the meantime, the main raw materials for production of EB is bitumen itself. However, most of the EB available in the market are using the industrial aggregate of bitumen as their source of raw material whereby the production of EB by using modified bitumen is still minute. In the meantime, the research on the development of modified bitumen from waste as their source of raw materials is still limited. Thus, the needs for the production of Emulsified Modification Bitumen (EMB) from waste as an alternative to the current products is very important.

The major application of EMB is for coating and insulation on or in the interior surfaces of the wall. The liquid properties of the EMB will assist the coating and insulation process because it can be sprayed on the surface of the wall by using the airless spray painting equipment. This is a substantial role in the coating and insulation procedure as it can reduce the time needed for the process and maintaining the uniformity of the mixture on or in the surface of the wall. The uses of EMB in the coating and insulation of interior surface of the wall is vital due to facts that it is able to prevent the infiltration of moisture into the wall, reduce the heat losses to the surrounding during rainy seasons and assisting in the reduction of heat transfer to the building during hot weather. The presence of moisture content in the inner wall will become the catalyst for the growth of fungi and mould. Exposure to fungi and mould may result in allergy, asthma, hypersensitivity, respiratory infections, cognitive defects and difficulties in concentration (Haleem Khan & Mohan Karuppayil, 2012).

The existing research focusing on the performances and qualities of the EB on the road application, waterproofing and anticorrosion coating of oil and gas pipelines. This research is focusing on the performance and quality of emulsified modified bitumen as interior surface coating and insulation in the operation theatre.

2. RESEARCH METHODOLOGY



3. LITERATURE REVIEW

Bitumen emulsion is an important building material, especially in highway pavement construction. It is a mixture of bitumen (asphalt), water and emulsifying agent, dispersed in tiny particles in an aqueous medium. It is an important material widely used in the pavement construction ever since the first introduction in the year 1900's (Yaacob et al., 2013). The emulsifier is an amphiphilic substance with a hydrophilic head and a lipophilic coil. It resides at the interface between the bitumen droplet and the water phase, acting as a stabilizer which reduces the interfacial tension between both phases and facilitates the emulsification process. In terms of the surface charge of the hydrophilic end, cationic emulsifiers are used, by far, in a larger scale than anionic or non-ionic emulsifiers in the bitumen emulsion industry (Yuliestyan et al., 2017). Due to the high viscosity of bitumen, bitumen can rarely be used in its raw form so several technique can be used to reduce the viscosity such as heating but heating generally will use a lot of energy consumption. So the other alternative to reduce the viscosity is by using additives. It also can improve the mechanical performance of modified emulsified bitumen in terms of tensile strength, resistance to permanent deformation and stiffness (Ayar, 2018). According to the current literature review, most of the emulsified modified bitumen (EMB) available in the market is formulated by using the industrial grade bitumen where the crude oil as the main source of the raw materials. Generally, just a few products has been developed by using modified bitumen.

4. FINDINGS

- a) The best modified bitumen formulation is combination of bitumen grade 60/70 and used oil. The modification of bitumen with polymer sources waste like HDPE, crump rubber and polystyrene will produce lump and the uses of waste sludge and crude oil produce irregularities in the formulation.
- b) Different types of emulsifier do effect the performance of EMB. In this research cationic type of emulsifier is preferable
- c) The higher the composition of bitumen in the formulation, the higher the ability of the EMB to insulate heat
- d) The performance of formulated EMB is comparative to the industrial bitumen emulsion. The ageing results of the formulated EMB showed that the ageing period is temperature dependant.

a) CONCLUSION

From the analysis that have been conducted on the Emulsified Modification Bitumen (EMB) on adhesion, ageing and heat transfer, here are the conclusions that can be made:

1. It is found that the EMB with ratio of 5.0:3.3:0.08:1.62 is the best formulated bitumen emulsion and resembles the industrial bitumen emulsion (Atlas).
2. In overall of characterization and performance, using cationic emulsifier in the formulations (EMB) is the best one.

ACHIEVEMENT

- i) Name of articles/ manuscripts/ books published
 - Study on Coating and Insulation Effect Using Emulsified Modification Bitumen (Construction and Building Materials (CONBUILDMAT-D-19-09509))
- ii) Title of Paper presentations (international/ local)
 - Formulation of Bitumen Emulsion From Industrial Waste (Malaysian Technical Universities Conference on Engineering and Technology, 2019)
 - Formulation of Modified Bitumen Modification From Industrial Waste (International Conference of Chemical Engineering & Industrial Biotechnology, 2018)
 - Modification of Bitumen using Polyacrylic Wig Waste(The International Conference on Engineering and Technology, 2017)
- iii) Human Capital Development
 - 2 master student, 4 undergraduate student
- iv) Awards/ Others
 - Gold Medal Creation, Innovation, Technology and Research Exposition (CITREX 2019 & 2020)
 - Gold Medal International Festival of Innovation on Green Technology (i-Finog 2019)
 - Gold Medal International Science and Invention Fair (ISIF 2018)
 - 1st Prize Winner National Chemical Engineering Symposium (2018)
 - Silver Medal International Science and Invention Fair (ISIF 2019)
- v) Others
 - Participants Regional Chemical Engineering Undergraduate Congress (RCEUC 2019)

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