



**CRACK GROWTH OF FIBRE-REINFORCED PLASTIC (FRP)/POLYMER
MIXED CONCRETE (PMC) SYSTEM (BONDED BY POLYESTER RESIN)
DUE TO CONSTANT LOAD/STRESS**

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ABSTRACT

Cement concrete have been used in construction industry for many years because of their good compressive strength, cheap, and lasting. However, cement concrete that we are using are brittle, easy crack, and water can diffuse through the cement concrete due to bending and tensile load. Because of that we need to do regularly maintenance. It will increase the cost of engineering work. The cement concrete is also heavy and it is not easy to transport it to site.

In recent years, applications of cement concrete in construction industry have been improved in terms of strength and light. This reduces the maintenance and transportation costs.

The use of polymers was considered to be a sign of progress and modern attitude in construction. Glass fibre reinforced polyester panels, polyester resin and polyester mortar were known as inexpensive plastics. Epoxy glues were used as highly performing adhesives in concrete precast applications, meanwhile epoxy resins were used as binders in chemically resistant coatings and flooring systems. Research aimed at developing new, improved polymers was continuously done.

In a few years, the construction industry has shown significant interest in the use of high strength concrete. The use of fibre reinforced plastic to improve the strength and deformation properties of the cement matrix is now well established. The concept of fibre reinforced plastic is to use the deformation of the matrix under stress to transfer load to the fiber. This is due to improvements in structural performance, such as high strength and durability.

As a student of Faculty of Mechanical Engineering at Uitm Shah Alam, a study of the crack growth rate between Fibre-reinforced plastic and Polymer mixed concrete was conducted. Polymer mixed concrete was produced with mix proportion 30:70 where sand river as an aggregate. This was followed by producing Fibre-reinforced plastic comprises of plies of glass fabrics of Chopped Strand Mat (CSM) and Woven Roving (WR). The fiber-reinforced was made from fiberglass (fibre sheet), hardener (M-50) and epoxy. The epoxy is combination of hardener and resin where the ratio is 1:4. The composites were prepared by hand lay-up techniques. The material is consisting of 1 layer of glass fiber with epoxy resin, arranged in Chop Strand Mat (CSM)/woven/ Chop Strand Mat (CSM). Using abrasive cutter, both the PMC and FRP were cut into 36 pieces.

The specimens then were exposed to aggressive environments such as air, water, and acid. Increased of weight of the specimens was recorded every four hours until the weight was constant. After that, crack growth rate of the specimens were investigated using PM Vibration Exciter Type 4808.

In this study, it indicates that FRP/PMC system bonded by polyester resin after immersed in water and acid failed in a period of time when a constant load from vibrator was given. It takes about 44 to 50 hours for the specimens to fail after being exposed in free air compared to water and acid where the specimen failed after 40 to 52 hours. Failure occurs when the initial crack given from sandwich between FRP and PMC starts to propagate continuously until FRP and PMC get separated.

TABLE OF CONTENTS

CONTENTS	PAGE
PAGE TITLE	i
ACKNOWLEDGEMENT	ii
ABSTRACT	iii
TABLE OF CONTENTS	v
LIST OF TABLE	viii
LIST OF GRAPH	ix
LIST OF FIGURE	x
LIST OF PICTURE	xi
CHAPTER 1 INTRODUCTION	1
1.1 Objective of Project	1
1.2 Significance of project	1
1.3 Scope of Project	2
CHAPTER 2 LITERATURE REVIEW	3
2.1 Review of Previous Studies	4