Fuzzy logic progress to predict of mechanical properties for shotcrete concrete containing waste plastic

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This work aims to build fuzzy logic model depended on experimental study. The lab work goal to show the possibility of using waste plastic (Polyethylene Terephthalate (PET), that got by shredded PET bottles) as aggregate, which substituted part of natural aggregate in the manufacturing of the shotcrete concrete. For this purpose, an experimental study was carried out to evaluate strength of the shotcrete concrete that contained waste plastic aggregate and were compared with reference shotcrete concrete without plastic aggregate. The natural aggregate is substituted with the PET-aggregate at percentage (0%, 1 %, 2.5%, by volume of the fine aggregate) to produce shotcrete concrete mixes, in addition, using super plasticizer (SP), and silica fume (SF), as a partial replacement by weight of cement.

Also fiber plastic used (0.5% by the total volume of mixture) as alternative for steel fiber in shotcrete mixture. To can achieve the ideas of research, the compressive and flexural tests apply for all samples. 72 total samples would test for research purpose. The research could be the first trying to study addition of waste plastic to shotcrete concrete and prediction of their effect by using fuzzy concept. The results obtained from the fuzzy logic prediction model were not accurate compared with the average results of the experiments and were found to be remarkably not so close to one another. This result may be because not sufficient data. The result of flexure test show when use a 2.5 % of plastic aggregate could increase flexure strength around 5.14 % at 28 days. While the compressive tests appears that it use 0.5% of fibre plastic as alternative of steel fibre could increase the compressive strength around 5.11% at 7 days while the different mixture cause decreasing around (16.70% to 52.42%) at 7 days. The results indicate that the compressive strength decreases with the increase of PET-(aggregate) content compared to the

reference shotcrete concrete approximately for all mixes, that the addition of waste plastics aggregate has a negative impact on compressive strength of shotcrete concrete. The average error for the predicted mechanical properties (around all properties) in fresh and hardened concrete is 45%.