

## Pengaruh Penambahan fly ash pada proses pembuatan beton terhadap karakteristik beton di dalam larutan asam sulfat = Effect of fly ash fortification in the manufacture process of making concrete towards characteristics of concrete in sulfuric acid solution

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### Abstrak

Fly ash merupakan material silica atau aluminosilica yang dapat dimanfaatkan sebagai konstituen semen pada proses pembuatan beton. Pemanfaatan fly ash bertujuan untuk meningkatkan durabilitas serta meminimalisir penurunan kekuatan tekan beton yang terpapar pada lingkungan asam, dimana hal ini dapat dicapai melalui reaksi pozzolanic antara fly ash dengan  $\text{Ca}(\text{OH})_2$  yang ada di dalam beton. Menurunnya kandungan  $\text{Ca}(\text{OH})_2$  melalui reaksi pozzolanic akan meminimalisir terbentuknya senyawa ettringite (senyawa penyebab deteriorasi dan penurunan kuat tekan beton).

Untuk mengetahui hubungan antara penambahan fly ash terhadap karakteristik beton (kuat tekan dan durabilitas) pada lingkungan asam, maka penelitian dilakukan dengan memvariasikan komposisi fly ash pada beton mulai dari 0%, 5%, 25%, 50%, hingga 75%, serta konsentrasi larutan  $\text{H}_2\text{SO}_4$  sebagai media perendaman mulai dari 0%, 5%, 10%, hingga 15% (v/v). Penelitian dilakukan dengan merendam sampel beton selama 4 hari pada larutan  $\text{H}_2\text{SO}_4$  dengan berbagai variasi konsentrasi. Karakterisasi durabilitas dan kuat tekan beton ditinjau melalui persentase kehilangan berat dan persentase penurunan kuat tekan beton setelah proses perendaman.

Berdasarkan hasil penelitian, untuk setiap variasi konsentrasi larutan  $\text{H}_2\text{SO}_4$  yang digunakan, diketahui bahwa persentase penurunan berat beton minimum (durabilitas maksimum) serta penurunan kuat tekan beton minimum ditemukan pada penggunaan fly ash sebesar 75%. Untuk setiap variasi konsentrasi media perendaman larutan  $\text{H}_2\text{SO}_4$  mulai dari 5%, 10%, hingga 15% (v/v), penurunan berat beton minimum secara berturut-turut adalah 0,47%, 0,87%, 1,28%, sedangkan penurunan kuat tekan beton minimum secara berturut-turut adalah 5,71%, 14,29%, 17,14%. Disimpulkan bahwa penggunaan fly ash dapat meningkatkan durabilitas serta meminimalisir penurunan kuat tekan beton yang terpapar pada lingkungan asam.

.....Fly ash is a silica or aluminosilica material that can be used as a constituent of cement in the concrete manufacturing process. Utilization of fly ash aims to improve durability and minimize the reduction of concrete's compressive strength exposed to an acidic environment, where this can be achieved through the pozzolanic reaction of fly ash with  $\text{Ca}(\text{OH})_2$  within concrete. The reduced content of  $\text{Ca}(\text{OH})_2$  through pozzolanic reaction will minimize the tendency of ettringite formation (compounds that cause deterioration and decrease the compressive strength of concrete).

To determine the relation between fly ash replenishment into concrete with concrete's characteristics (compressive strength and durability) under acidic environment, then the research is conducted by varying the fly ash composition ranging from 0%, 5%, 25%, 50%, up to 75%, and the concentration of  $\text{H}_2\text{SO}_4$  solution as an immersion medium ranging from 0%, 5%, 10%, up to 15% (v/v). The research carried out by immersing the concrete samples for 4 days in  $\text{H}_2\text{SO}_4$  solution with various concentrations. Characterization of concrete's durability and compressive strength is reviewed from the concrete's weight loss percentage

and reduction of concrete's compressive strength percentage after immersion.

Based on the research results, for each variation of H<sub>2</sub>SO<sub>4</sub> concentration used, the minimum concrete's weight loss percentage (maximum durability) and the minimum reduction of concrete's compressive strength percentage is found in the use of fly ash by 75%. For each concentration variations of H<sub>2</sub>SO<sub>4</sub> solution as an immersion medium ranging from 5%, 10%, up to 15% (v/v), the minimum concrete's weight loss percentage was 0.47%, 0.87%, 1.28% (respectively), whilst the minimum reduction of concrete's compressive strength percentage was 5.71%, 14.29%, 17.14% (respectively). It was concluded that the use of fly ash can improve the durability and minimize the reduction of compressive strength of concrete exposed to an acidic environment.