

# Studi pengaruh penambahan inhibitor senyawa phosphate dan nitrite terhadap laju korosi baja tulangan ST 37 dalam larutan perendam air laut dan air laut konsentrasi tinggi = Research of the effect of phosphate and nitrite form addition as inhibitor on reinforcing steel ST 37 corrosion rate in sea water and high concentration sea water environment

Nurisa, author

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## Abstrak

Beton bertulang merupakan bahan yang sangat umum digunakan pada sistem-sistem konstruksi. Seiring dengan meningkatkannya kebutuhan manusia dan peningkatan laju pertumbuhan populasi serta kemajuan teknologi, menuntut ketersediaan lahan yang memadai untuk pembangunan infrastruktur tersebut. Pada umumnya, struktur suatu bangunan direncanakan dapat berfungsi selama masa layan tertentu. Namun, selama masa layan ini, bangunan beton bertulang rentan terhadap kerusakan akibat berbagai hal seperti korosi terutama jika bangunan berada pada lingkungan agresif. Korosi baja tulangan merupakan penyebab utama turunnya umur layan struktur beton bertulang. Volume senyawa hasil reaksi korosi baja tulangan dapat menempati 3 kali volume baja yang terkorosi sehingga menyebabkan tekanan pada beton. Kerugian akibat korosi di Indonesia diperkirakan mencapai angka trilyun rupiah. Inhibitor dalam jumlah optimum dapat ditambahkan sebagai substansi kimia yang sangat efektif dalam mengurangi laju korosi baja tulangan. Metode yang digunakan untuk mengukur laju korosi dalam penelitian adalah weight loss of metal dan polarisasi. Berdasarkan metode weight loss of metal, diketahui laju korosi menurun hingga 92,07 % pada hari ke-120 dengan penambahan inhibitor Phosphate 90 ppm pada air laut konsentrasi normal dan 93,06 % dengan penambahan inhibitor Phosphate 60 ppm pada air laut konsentrasi tinggi. Berdasarkan metode polarisasi, diketahui laju korosi menurun sebanyak 70 % pada hari ke-90 dengan penambahan inhibitor Phosphate 60 ppm pada air laut konsentrasi normal dan 72,53 % pada air laut konsentrasi tinggi dengan penambahan inhibitor Phosphate 90 ppm. Sehingga, umur layan beton meningkat hingga dua kali lipat dari umur layan beton tanpa inhibitor. Laju korosi menurun sebesar 50 % pada air laut dengan konsentrasi Cl<sup>-</sup> sebanyak 11 ? 14 % dari volume air laut dibandingkan dengan air laut dengan konsentrasi Cl<sup>-</sup> sebanyak 1 ? 1,4 % dari volume air laut.

.....Reinforced concretes are material that generally used in construction systems. As the increase of human needs, population number and technologies, demand sufficient site procurement to build those structures. This condition forces civil engineer to build structure on unqualified or corrosive area, like sea water environment. Usually, a structure plans to be used in certain durability. But, this durability fragile from damage that caused by several things such as corrosion, specially if the structure build on aggressive environment. Corrosion of steel in concrete is the main cause of durability degradation of the reinforced concrete structure. Corrosion product volume will be three times bigger than steel volume which causing longitudinal crack to the concrete and reduce steel's diameter. Corrosion loss in Indonesia cost billion of rupiahs. Inhibitor in sufficient volume can be added as chemical mixture and will reduce the corrosion rate. Inhibitor that used in this research are Phosphate and Nitrite. Measuring corrosion rate method that used in this research are weight loss of metal dan polarization. The research shows that the use of Phosphate as

inhibitor is more effective than Nitrite and consider that Nitrite is chemically dangerous to the environment. Based on weight loss of metal corrosion measuring methods, corrosion rate decrease until 92,07 % in day-120 with Phosphate 90 ppm addition in normal sea water and 93,06 % in day-120 with Phosphate 60 ppm addition in high concentration sea water. Based on polarization corrosion measuring methods, corrosion rate decrease until 70 % in day-90 with Phosphate 60 ppm addition in normal sea water and 72,53 % in day-90 with Phosphate 90 ppm addition in high concentration sea water. Those inhibitors increase durability of reinforced concrete structure two times higher than the structure without using inhibitor. Research also shows that Cl<sup>-</sup> added as much as 11 ? 14 % of sea water volume cause decrease of corrosion rate until 50 % compared with normal Cl<sup>-</sup> concentration 1,1 ? 1,4 % of sea water volume.