

Pengaruh water backing pada pengelasan fillet busur listrik mild steel plate bki grade "A" untuk konstruksi lambung kapal niaga

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Abstrak

ABSTRAK

Pengelasan konstruksi lambung kapal yang terletak di bawah permukaan air (water backing welding) pada kondisi kapal mengapung di taut sampal saat ini masih menjadi permasalahan. Permasalahan tersebut merupakan tantangan yang harus dipecahkan dalam Industri galangan kapal modern. Pengelasan kondisi water backing belum boleh dilaksanakan karena mutu akhir lasan tidak diketahui secara pasti. Dalam studi ini dilakukan penelitian skala laboratorium untuk mengetahui pengaruh water backing terhadap perubahan sifat mekanis dan metalurgis lasan pelat baja lunak spesifikasi Biro Klasifikasi Indonesia grade A. Penelitian dilaksanakan dengan mempersiapkan Welding Procedure Specification sesuai AWS 3.6-83, A type dry weld. Pengelasan manual (SMAW) pada sambungan fillet dilaksanakan dengan elektrode hidrogen rendah (AWS E7016), teknik deposisi logam las stringer bead dan temper bead. Dua pengelasan dengan kondisi Water backing dan Water backing preheat 100 °C dilakukan di atas bak air taut, sedangkan satu acuan pengelasan dilakukan dalam kondisi kering. Pengujian yang dilakukan dalam studi ini meliputi: 1) Uji radiografi; 2) Uji Visual; 3) Uji tank logam las; 4) Uji tarik geser las fillet; 5) Uji patahan las fillet; 6) Uji tarik logam las; 7) Uji Kekerasan mikro; dan 8) Foto metalografi. Selain delapan pengujian di atas laju pendinginan pada pengelasan water backing juga diukur dari hasil pengujian, observasi dan analisa data dapat disimpulkan, bahwa: 1) Water backing menurunkan regangan maksimum lasan kering 45 %, menaikkan nilai kekerasannya 10,5 %, dan menurunkan kekuatan impaknya (pada suhu uji 10 °C) 36,5 %; 2) Prapemanasan 100 °C pada pengelasan water backing menurunkan regangan maksimum lasan kering 29 %, menaikkan nilai kekerasannya 7 %, dan menurunkan kekuatan impaknya (pada suhu uji 10 °C) 25,6 %; 3) Water backing menghasilkan struktur mikro martensit pada batas las; 4) Semua hasil pengujian laboratorium yang telah disimpulkan di atas secara teknis masih memenuhi standard AWS 3.6; 5) Teknik deposisi temper bead tidak meningkatkan kekuatan geser las fillet dan hanya memperbaiki struktur mikro lasan. 6) Semua WPS yang telah dikualifikasi memenuhi syarat AWS 3.6 sehingga semua prosedur pengelasan yang telah dilakukan dalam studi ini dapat diterapkan untuk las produksi alternatif.

<hr><i>ABSTRACT

The welding of ship hull construction under sea water level (water backed welding) on floated condition is still problem recently. This kind of problem is a challenge to solve for modern shipbuilding industry. The water backed welding can not perform until now, cause the final quality of weldments is not know exactly. The laboratory research has done to study the effects of water hacking on mild steel plate welded with grade A specification of Biro Klasifikasi Indonesia. The research is performing by preparing twelve kinds of welding procedure specifications in according to AWS 3.6, A type dry weld. The low hydrogen type (AWS E7016) of electrodes has used to manually weld (Shield Metal Arc Welding) fillet joint of steel plate on stringer bead and temper bead deposition techniques. Both of waters backed and water backed preheated 100 °C welding has performed above circulated sea water tank and the other one of welding that used as

reference is performed on dry condition. The eight of examination and test kind are performed in this study, that are radiography examinations, visually examinations, all weld metal tensile tests, fillet weld shear test, fillet weld fracture test, Charpy "V" notched impact test, micro hardness test, and metallographic on welded steel plate. Beside examinations and test above stated, cooling rate of water backed welding is studied in this research. Based on the above stated the conclusions are listed as state on below. 1) Water backing is decrease the maximum strain of dry weld up to 45 %, its impact strength on 10 centigrade of test temperature up to 36.5 %, and increases its hardness up to 10.5 %. 2) The application of 100 °C preheating on water backed welding is decrease the maximum strain of dry weld up to 29 %, its impact strength on 10 centigrade of test temperature up to 25.6 %, and increase its hardness up to 7 %. 3) The water backed welding is tending to form the martensite micro structure on weld fusion zone. 4) All of the laboratory test results have above concluded technically is satisfactory to AWS .3.6. 5) The application of temper bead technique deposition of weld metal is not increase the fillet weld shear strength, but only improved the weld micro structure. 6) All of WPS has qualified is fulfill to AVVS .3.6 specification and all of them can apply to production weld alternatively.