

Pengaruh Parameter Proses Warm Stamping Terhadap Sifat Mekanik dan Struktur Mikro Baja SAPH 400 = The Effect of Warm Stamping Process parameter to mechanical properties and microstructure of SAPH 400 Steel

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Abstrak

Pemakaian material high tensile pada komponen otomotif semakin marak seiring dengan tuntutan cost reduction dalam dunia industri. Permasalahan mengenai besarnya tonnase proses dan sifat mampu bentuk material menjadi dasar dikembangkannya proses warm forming. Penelitian ini bertujuan untuk mendapatkan parameter optimal untuk proses warm forming sehingga bisa dihasilkan produk sesuai dengan standard komponen tanpa terjadinya kerusakan. Proses warm forming material SAPH 400 dengan variasi temperatur pre-heat menunjukkan bahwa besarnya pengurangan tonnase terbesar dihasilkan pada saat material dipanaskan pada temperatur pre-heat sebesar 600°C, dimana pengurangan tonnase proses mencapai 27% (4 Ton) dari tonnase cold forming (5,5 Ton). Semakin tinggi temperatur pre-heat, maka semakin mudah butiran dalam material terdeformasi, sehingga bentukan butir dari sample setelah dikenai proses warm forming menjadi pipih. Besarnya deformasi yang diterima oleh material membuat kerapatan antar butir meningkat serta menyebabkan pergerakan dislokasi akan terhambat, hal ini akan menyebabkan sample dengan variasi pre-heat sebesar 600°C mengalami kenaikan tensile strength sebesar 13% (menjadi 408 MPa dari 361 MPa), akan tetapi mengalami penurunan elongation sebesar 25% (menjadi 39,1% dari 52,4%). Penambahan air di cooling channel dalam dies menyebabkan kenaikan cooling rate menjadi 2 kali lipat menjadi 30°C/s, sehingga sample dengan media cooling menggunakan air yang mengalami kenaikan tensile strength sebesar 13% (menjadi 408 MPa dari 361 MPa). Sample yang dilakukan proses warm forming tanpa proses anil hanya mengalami kenaikan tensile strength sebesar 5%, karena material hanya mengalami proses tempering saja tanpa mengalami perubahan fasa, sehingga hal ini menyebabkan sample tanpa proses anil tetap susah ditingkatkan tensile strength-nya walaupun sudah dilakukan deformasi plastik dan proses cooling saat proses warm forming

.....In the industrial, high tensile materials used for automotive components generally increase due to of the cost reduction requirement. Issues concerning the amount of tonnage process and formability of material becomes warm forming process of developing basic. This study aimed to obtain the optimal parameters for warm forming process so that products can be produced in accordance with standard components without damage. The warm forming process of SAPH 400 steel with a pre-heat temperature variation indicates that the magnitude of the largest tonnage reductions generated when the material is heated at 600°C of a pre-heat temperature, where the tonnage reduction reached 27% (4 Ton) from cold forming tonnage (5.5 Ton). The higher the preheat temperature, the more easily deformed grains in the material, so that the formation of grain samples after subjected to warm forming process becomes flat. The amount received by the material deformation made ??between grain density increases and causes the movement of dislocations is inhibited, this will cause the sample to the variation of preheat of 600°C tensile strength increased by 13% (from 361 MPa to 408 MPa), but the elongation decreased by 25% (to 39.1% from 52.4%). The addition of water in the cooling channels in the dies causes an increase in cooling rate become twice to 30 °C/s, so the sample by

using water cooling media that tensile strength increased by 13% (from 361 MPa to 408 MPa). Samples were subjected to warm forming process without annealing process is only increased tensile strength by 5%, because the material only experienced tempering process without phase transformation, so this causes the sample without annealing process remains difficult improved its tensile strength despite tight plastic deformation and cooling process when the warm forming process