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CRITICALITY OF HEAT TREATMENT ON THE PROPERTIES ENHANCEMENT OF MILD STEEL

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ABSTRACT

In this current work undertaking, the author examined the heat treatment effect on the tensile properties of Annealed Mild steel. The distinct heat treatments like annealing, normalizing and tested the mechanical properties terminate Torsion Testing Machine. Although heating the material the ductility of material, hardness, toughness should be changed. When we are going to heating the material, then we take superior result for bettering the material parameters of steel.

Keywords: Annealing, Heat Treatment, Hardness, Toughness, Tensile strength

I. INTRODUCTION

The long period of decades, mechanical parameters can be easily refined by heat treatment processes. The main considerable factor for enhancing the microstructure of material is normalizing and annealing. The normalizing process to the heated material up to austenitic temperature parameters. Then after air cooling is done. But hardening process, steel is heated at that temperature which can assist the composition of austenite and grip in temperature up to carbon has diffuse in water or oil steel is an alloy of iron in which carbon parameter varies from 0.15 -1.5 % and the plain carbon steel hold in 0.1 – 0.25%. In this current paper, we explain the heat treatment parameter used in the industry for hot work tool steels and conclusion of material for their hardness and toughness.

II. PROPOSED METHODOLOGY

The research analogous to the heat treatment effect on the Mechanical assets into the divergent fields of research [2].

1. Analytical study of the material associated to the parameter values of heat treatment evolution used to the specimen.

2. The Experimental studies of the material characterstics of the specimen and those samples were adjusted to discrete heat treatment processes.

3. Analyzing of microstructure on each type of heat treatment.

III. LITERATURE REVIEW

1. Gabriela Nicoletta[3] analyzed about the CA-15(ferrite steel) in synchronism of opinion with the ASTM 217 is one of the martensitic steel that meets the needs of the standard. And the results choosing the selection of

superior heat treatment parameter's which can proposition the good composite between the yield, tensile strength, impact strength at low-temperature hardness and in order to obtain a superior behavior of the material covered by corrosive environment way things shape up.

2. S.K. AKAY, M. YAZICI, [4] check over the effect of heat treatment evolution on mechanical characteristics of low-grade steel. At that work the author deliberates the new aggregation of HSLA (high strength low alloy steels) which is also known as DPS (dual phase steel). These two classes have to look up the safety standards of fuel economy, with the help of annealing the steel and equilibrium phase diagram and the dual phase of steel microstructures can be composed. The steel microstructures have a ferrite matrix forward with particle of martensite. The physical characteristics are depending upon the morphology of two phases. It can be regarded by changing the annealing temperature with time the annealing proceeding quenching medium and alloying element. This paper investigator deliberate about the heat treatment run by quenching depends upon the physical characteristics of Fe 0.055% C steel. The experimental procedure was the specimen used in this is 2.5mm thick and the chemical composition is fixed and then normalized at 910º C and hold for 45 minutes and then, air cooling is done.

3. B.S. Motagi[5], examined this paper about the heat treatment effect on the mechanical parameter of medium carbon steel. The author accepts various heat treatment processes distribution such as annealing, oil quenching and tempering. All these processes are as used at the different temperature such 200°C , 400° C and 600° C near around 1 hour. After complete this process, the specimen is proved mechanically such as tensile strength, ductility, hardness. The test was completed at room temperature. After this testing, the temperature of tempering is increasing but the steel hardness is decreasing. Therefore steel with copper has high superior strength in comparison to without copper.

4. Devnath Khunte[6] experimentally studied the material parameters like Tensile strength, yield stress at variance types of steels such as low carbon steel and the stainless steel on distinct heat treatment processes to check out the effect of annealing, quenching and normalizing on the mechanical properties at the time testing on Universal Testing Machine UTM. The different types of heat treatment process on the fracture, toughness and hardness are being analyzed. the technique of most favorable heat treatment on the commercial steel that drop in to tempering in the 900ºC temperature range and rise superior toughness and high hardness. Then the heated samples used for testing of distinct types of material properties. It means the heat treatment will be superior for bettering the mechanical characteristics of mild steel and stainless steel specimen.

IV. EXPERIMENTAL SET-UP

The whole test was applied on a torsional testing machine. The Torsional testing machine has been achieve for twisting the distinct types of wires and the tubes sheet materials and then torque would be measured by a pendulum dynamometer system. The Torque can be adjusted to the material with the help of geared motor is concluded a gearbox. The autographic recorder gives the relation enclosed by the torque and angle of twist.

Figure 1. Torsion testing machine

V. RESULTS & DISCUSSIONS

The Torsional Strength of a specimen without Heat Treatment as shown in table1.

Torsion (KNm)	*Angle (In Degrees)*
0	*0*
0.0411	*180*
0.0524	*360*
0.0589	*540*
0.0630	*720*
0.0644	*800*

Table 1. Torsion Strength of mild steel without heat treatment

Figure 2. Graph between degrees and torsion for mild steel (without heat treatment)

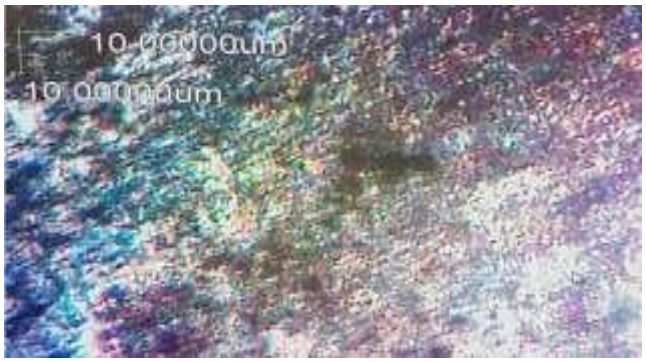

Figure 3. Mild steel microstructure (without heat treatment)

The Mechanical characteristics like Tensile Strength, Toughness & Hardness on the heat treatment affect due to Normalizing the specimen. After this Process we performed on the Torsional testing machine has designed for convey Torsion & Twisting moment.

Torsion	Degrees
0 KNM	0
0.0653KNM	360
0.0789KNM	720
0.0859KNM	1080
0.0907KNM	1440
0.0943KNM	1800
0.0970KNM	2160
0.0994KNM	2520
0.1013KNM	2880
0.1028KNM	3240
0.1051KNM	**3560**

Table 2. Torsion strength of mild steel with heat treatment (Normalizing)

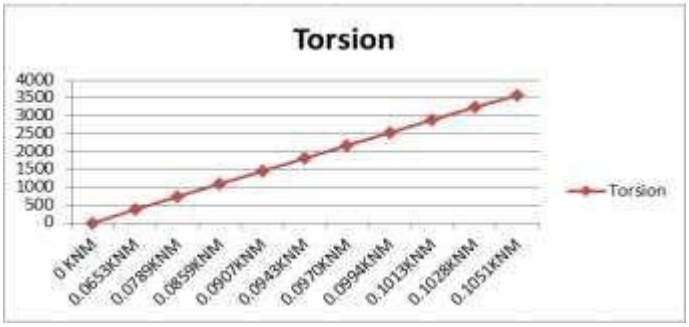

Figure 4. Graph between degrees and torsion for mild steel with heat treatment (Normalizing)

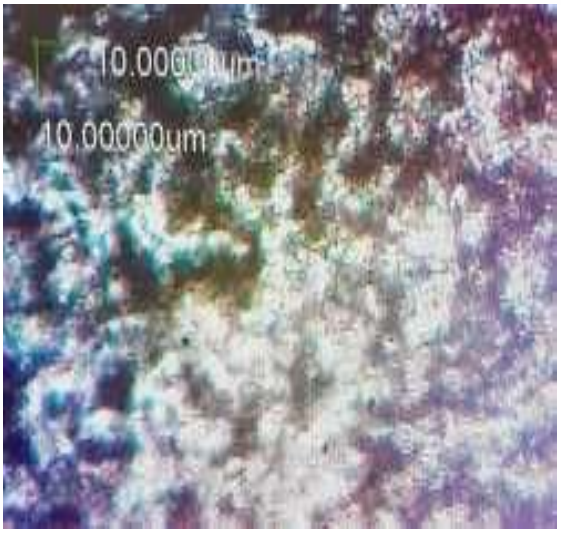

Figure 5. Mild Steel microstructure with heat treatment (Normalizing)

Torsion (K	Angle (In Degrees)
0 KNM	0
0.0522KNM	360
0.0655KNM	720
0.0721KNM	1080
0.0769KNM	1440
0.0803KNM	1800
0.0825KNM	2160
0.0852KNM	2520
0.0864KNM	2880
0.0877KNM	3240
0.0890KNM	3600
0.0904KNM	3960
0.0928KNM	4130

Table 3. Torsion Strength of mild steel wit heat treatment (Annealing)

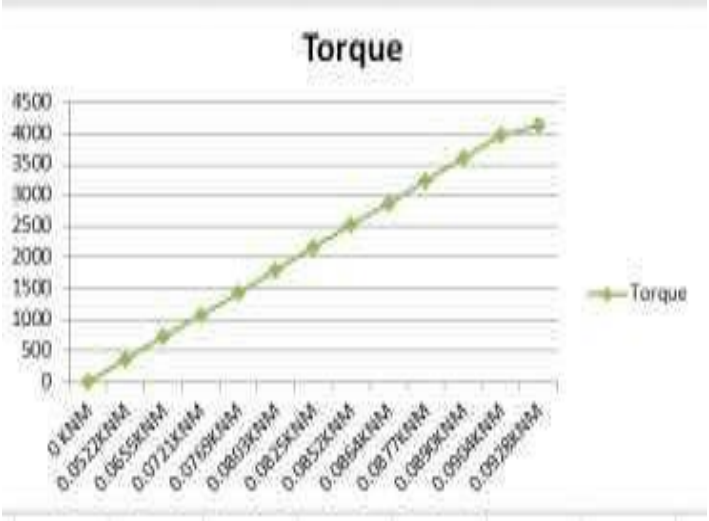

Figure 6. Graph between degrees and torsion for mild steel with heat treatment (Annealing).

The material microstructure shows the nucleation and recrystallization which is due to cold deformation.grain growth is be held at the higher degree of dislocation which can lead the reduction of mechanical parameters of material. Therfore its conclusion the mechanical parameters of nails and microstructure analysis, aspired to property of nails has achieved and composed the microstructure evolution of the mild steel at the same time as annealing [7].

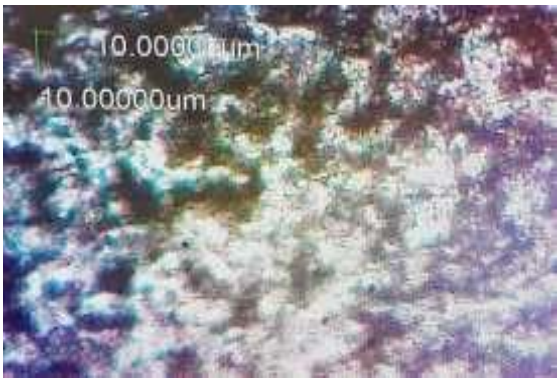

Figure 7. Mild Steel microstructure with Heat Treatment (Annealing)

VI. CONCLUSIONS

The time between performing this test, the heat treatment consequence on the annealed tensile properties was review. The material is heated at700^{o} C temperature during the full anneals that causes a large effect of the material parameter. It's effect on both the microstructure and the room temperature of tensile properties. The ductility of steel grade is increasing on increasing the tempering temperature. That shows mild steel has dual phase which can be incomparably enlarge by heat treatment processes. The conclusion shows that we can emend the strength at high temperature.

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