

2007/2/26:  
2007/8/2:

1.25  
(AISI 1020)  
CO<sub>2</sub> (MIG/ MAG)

(10,20,30)  
(20)

### Effect of Shot Peening on Fatigue Strength of Welded Joints For Low Carbon Steel

#### Abstract

The aim of this work is to study the effect of the time of shot peening with steel balls of 1.25 mm in diameter on fatigue strength of butt joints for low carbon steel (1020 AISI) welded by metal arc welding shielded with CO<sub>2</sub> gas (MIG/MAG). All fatigue tests were of the rotary bending type at mean stress of zero for welded unpeened samples and shot peened samples at various times.

It was found that all the shot peen times of (10,20,30) minutes have improved the fatigue strength and the best strength has been achieved at the time 20 minutes because of the high compressive stresses induced by the shot peen process and in addition to the denteritic microstructure in the weld zone for unpeened samples .

- 1

[3,2,1]  
MIG / MAG

(1)  
[4] MIG

( R=0.1)

[5,4 ]

- 2

( shot peen)

**Experimental Procedures**

**Metal**

1- 2

**Selection**

(AISI 1020)

(2)

[6 ] **Gurney**  
%39

(1)

**Welding  
Process**

2-2

(Butt Joint)

65° V

(Single V)

(14\*200\*250)

Miller Beltu Weld 602 USA

(1.2)

(AWSER705-6)

(2)

(60-50)

(0.5-0.1)

Shielded Gas

100% CO<sub>2</sub>

%

( )

[7 ](3)

( 4)

(3)

**Midori yoshikawa**

[8 ]

(Ti-6Al-4V)

( Anodized )

( 30, 20, 10 )  
 (Shot Plast)  
 (7 bar)  
 ( 15m/ sec ) ( X-ray Films)  
 (4)  
 5- 2  
 (1) 650°C  
 (2.5)  
 ( 187.5 ) (30) 3-2  
 ( ) (1)  
 (ASTM E8M, 1988 )  
 ( 5 ) ( 28\*14\*250 )  
 (2)  
 (5)  
 Fritsch Gmb+fpro and  
 (PX-SRG (Mehto) onrik  
 /5000)  
 600 (2)  
 (4)  
 (7) )  
 (S-N Curves) ) ( )  
 (4) ( )  
 (6)  
 ( 1000, 500, 320, 220 ) (Rotary Bending)  
 4- 2  
 (5 µm )  
 (Etching)  
 % 2 ( Nital) 1.25



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(1)

| Element % | C   | Si    | Mn   | Ni    | Mo    | Cu   | Co    | Al    | Ti   | V     |
|-----------|-----|-------|------|-------|-------|------|-------|-------|------|-------|
| wt%       | 0.2 | 0.009 | 0.50 | 0.027 | 0.005 | 0.41 | 0.004 | 0.001 | 0.01 | 0.009 |

(2)

| Element % | C     | Si    | Mn   | P     | S     | Al    | Ni    | Cr    | Cu    | Mo    |
|-----------|-------|-------|------|-------|-------|-------|-------|-------|-------|-------|
| wt %      | 0.068 | 0.763 | 1.41 | 0.020 | 0.014 | 0.026 | 0.041 | 0.026 | 0.006 | 0.002 |

(3)

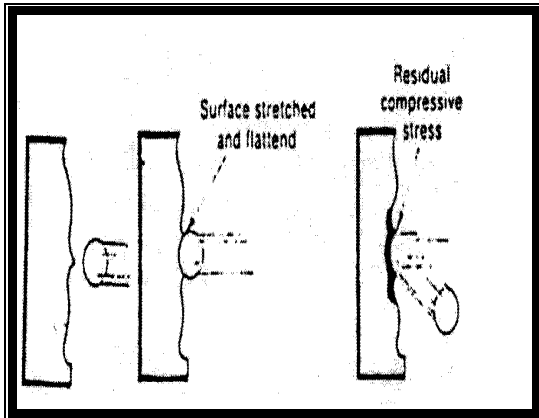
| Voltage (Volt) | Current (Amp) | Wire Speed (m/min) | No of pass | Heat input (KJ) | Thickness (mm) |
|----------------|---------------|--------------------|------------|-----------------|----------------|
| 30.5           | 213           | 318                | 1          | 1226            | 14             |
| 30.5           | 213           | 318                | 2          | 1226            | 14             |

(4)

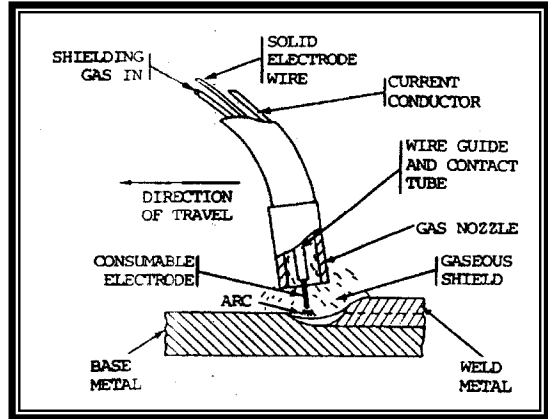
| Specimen No.       | A                       | B    | C    | D    |
|--------------------|-------------------------|------|------|------|
| Shot Time (min)    | As weld (No shot peen ) | 10   | 20   | 30   |
| Ball Diameter (mm) | -                       | 1.25 | 1.25 | 1.25 |

(5)

| Groups | $\sigma_y$ MPa | $\sigma_u$ MPa | HB Kg/mm <sup>2</sup> | $\sigma_f$ MPa | $N_f$ Cycles*10 <sup>3</sup> |
|--------|----------------|----------------|-----------------------|----------------|------------------------------|
| A      | 287            | 420            | 182                   | 210            | 2750                         |
| B      | 383            | 500            | 196                   | 225            | 2193                         |
| C      | 375            | 537            | 205                   | 250            | 2310                         |
| D      | 314            | 440            | 202                   | 235            | 2528                         |

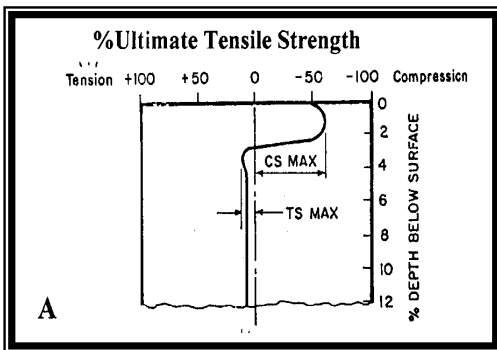


(2)

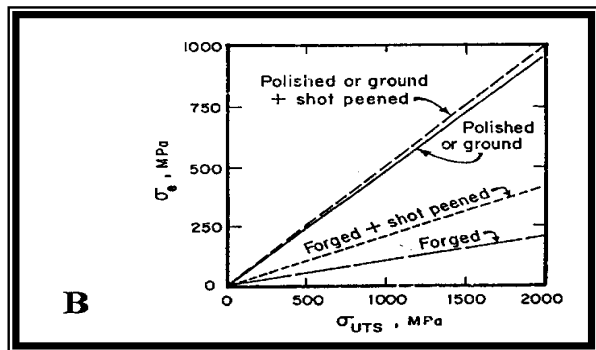


(1)

(MIG)

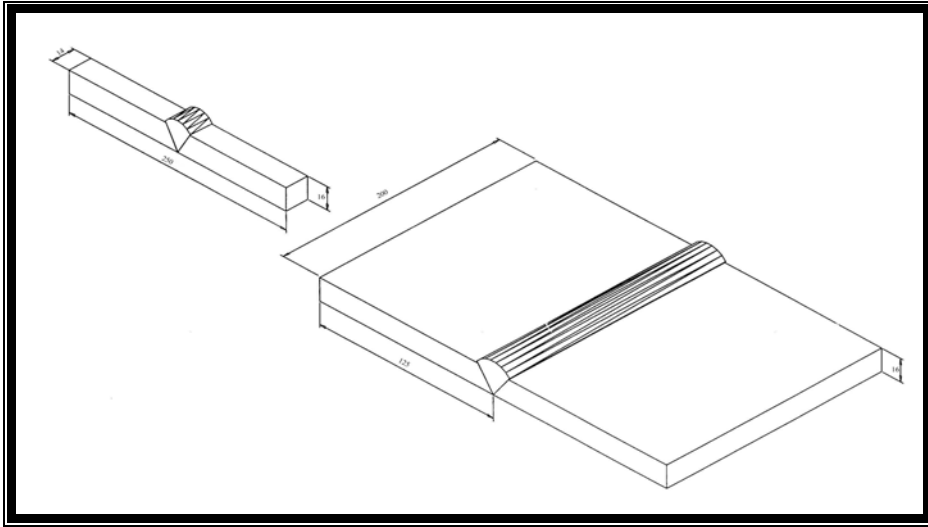


A

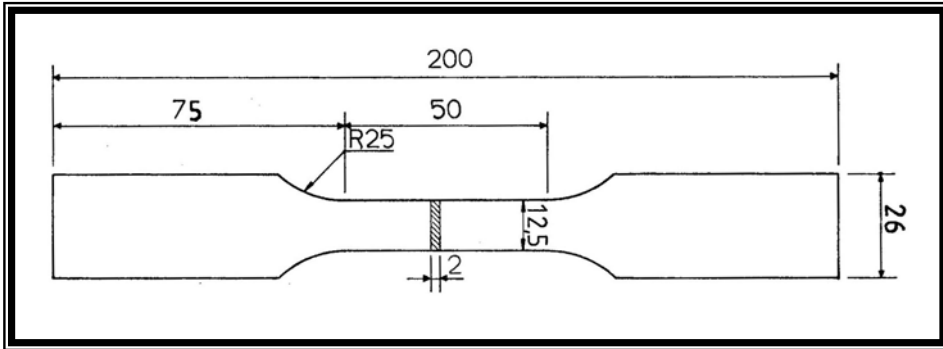


B

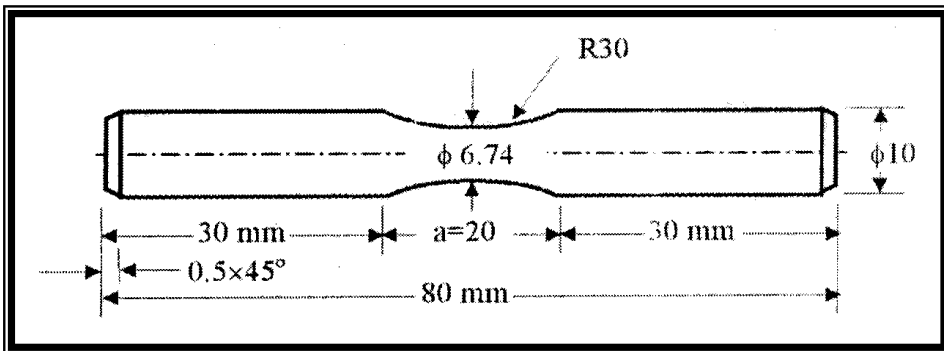
(3)



( ) (4)

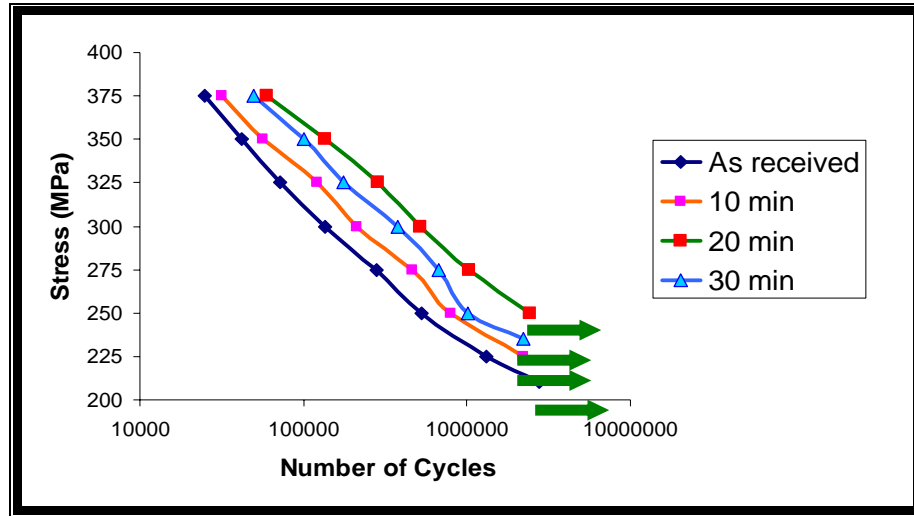


( ) (5)

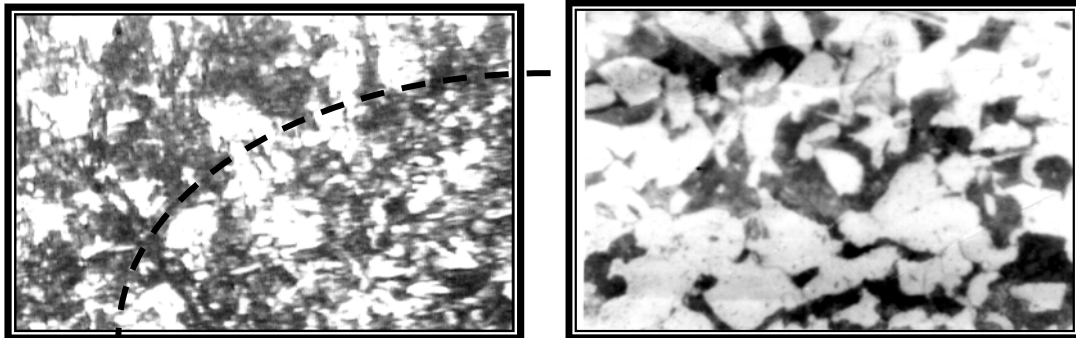


(6)

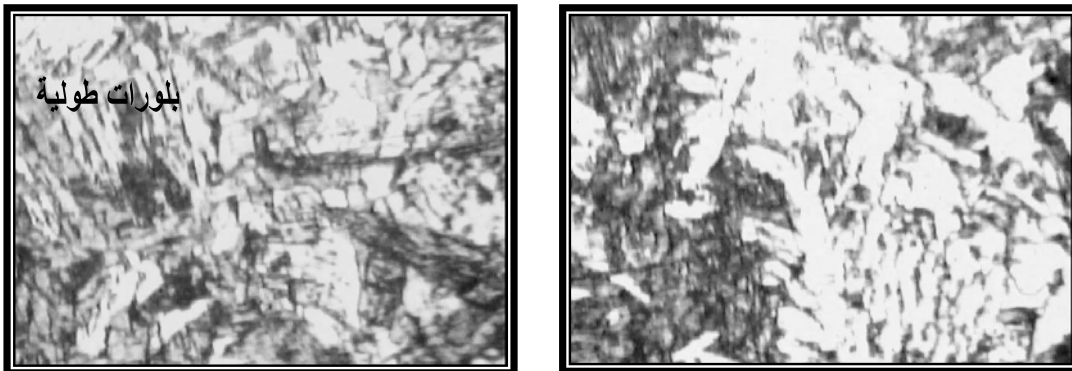




شكل (7) منحنيات الاجهاد - عدد الدورات (S- N Curves) لمجاميع العينات المقذوفة بالكرات الفولاذية عند اُزمان قذف مختلفة



(8)



400 X