

EMAT Probe HT Test Report

(The Probe with New Surface Protection Layer)

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1. Introduction

The outlook of materials for surface protection before testing :



(B) Testing procedures :

Testing conditions 1 :

With surface protection composites :

Each measurement was lasted for couples of seconds and left the hot surface when the thickness value was displayed. Cooled the probe down in air (air blowing it sometimes) for couples of seconds and touched the hot surface for second measurement again.

Tested at 200C first and then the probes were cool down to RT before tested at 400C, next planned HT. Similarly tests were done for 400C, 600C, and 800C

- (a) Confirm the probes' function at RT before tests at high temperature.
 - (b) Tests at 200C (each probe used to measure thickness at HT 3 times). Cooled down to RT.
 - (c) Tests at 400C (each probe used to measure thickness at HT 3 times). Cooled down to RT.
 - (d) Tests at 600C (each probe used to measure thickness at HT 3 times). Cooled down to RT.
 - (e) Tests at 800C (each probe used to measure thickness at HT 3 times). Cooled down to RT.
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Testing conditions 2 :

Without surface protection of white composite :

Removed the surface protection composites.

Each measurement was lasted for couples of seconds and left the hot surface when the thickness value was displayed. Cooled the probe down in air (air blowing it sometimes) for couples of seconds and touched the hot surface for second measurement again.

- (a) Confirm the probes' function at RT before tests at high temperature.
- (b) Tests at 200C (each probe used to measure thickness at HT 3 times). Cooled down to RT.
- (c) Tests at 400C (each probe used to measure thickness at HT 3 times). Cooled down to RT.
- (d) Tests at 600C (each probe used to measure thickness at HT 3 times). Cooled down to RT.
- (e) Tests at 800C (each probe used to measure thickness at HT 3 times). Cooled down to RT.

2. Testing Results and Records :

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Fig. 1

Figures 1 showed the probes with white composite protection on surface and the tested specimen outlook (carbon steel) before the test.



Fig. 2 It showed the probe functioned normally for thickness measurement



Fig.3 Figure 3 showed the probe surface outlook after tested at 200C.

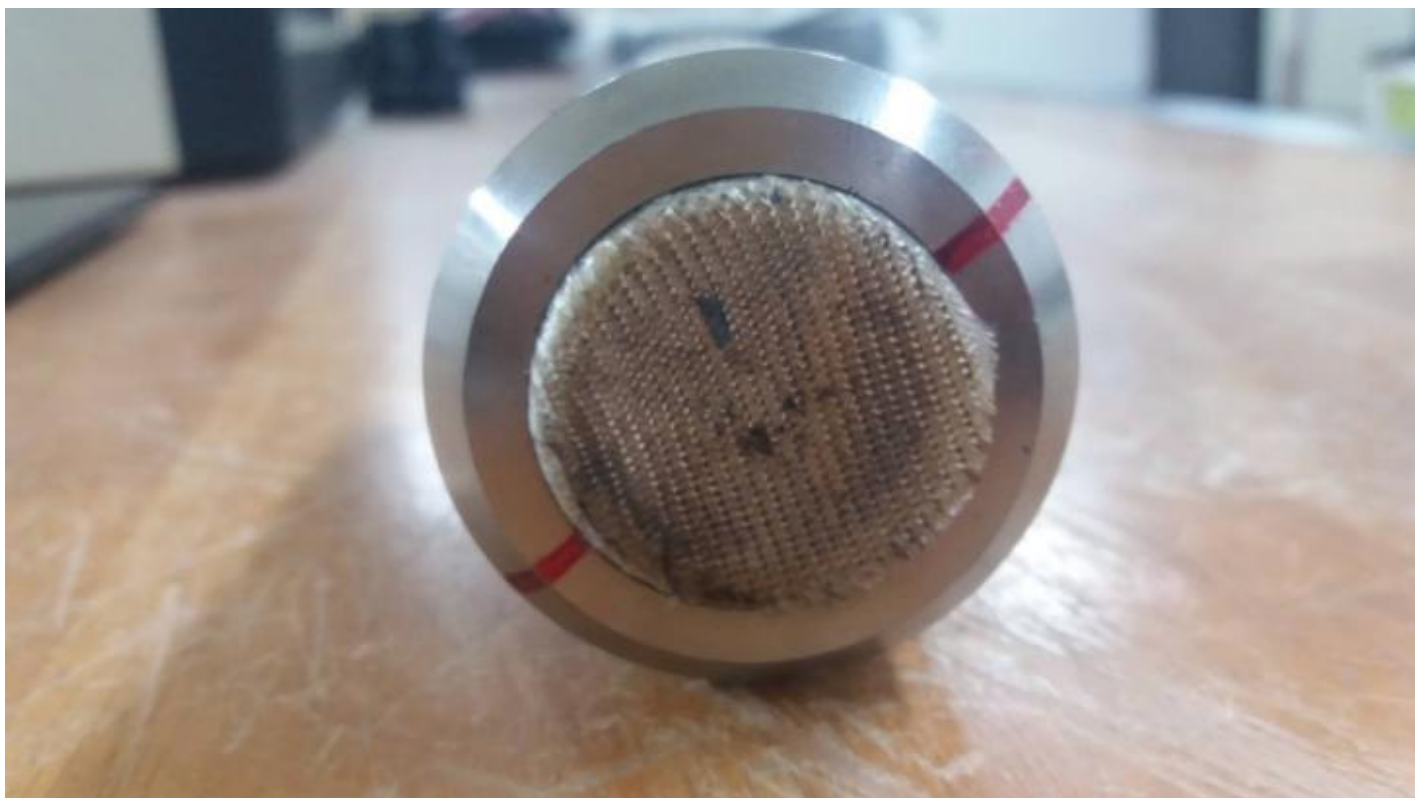


Fig.4 Figure 4 showed the probe surface outlook after tested at 400C.



Fig.5 Figure 5 showed the probe surface outlook after tested at 600C.

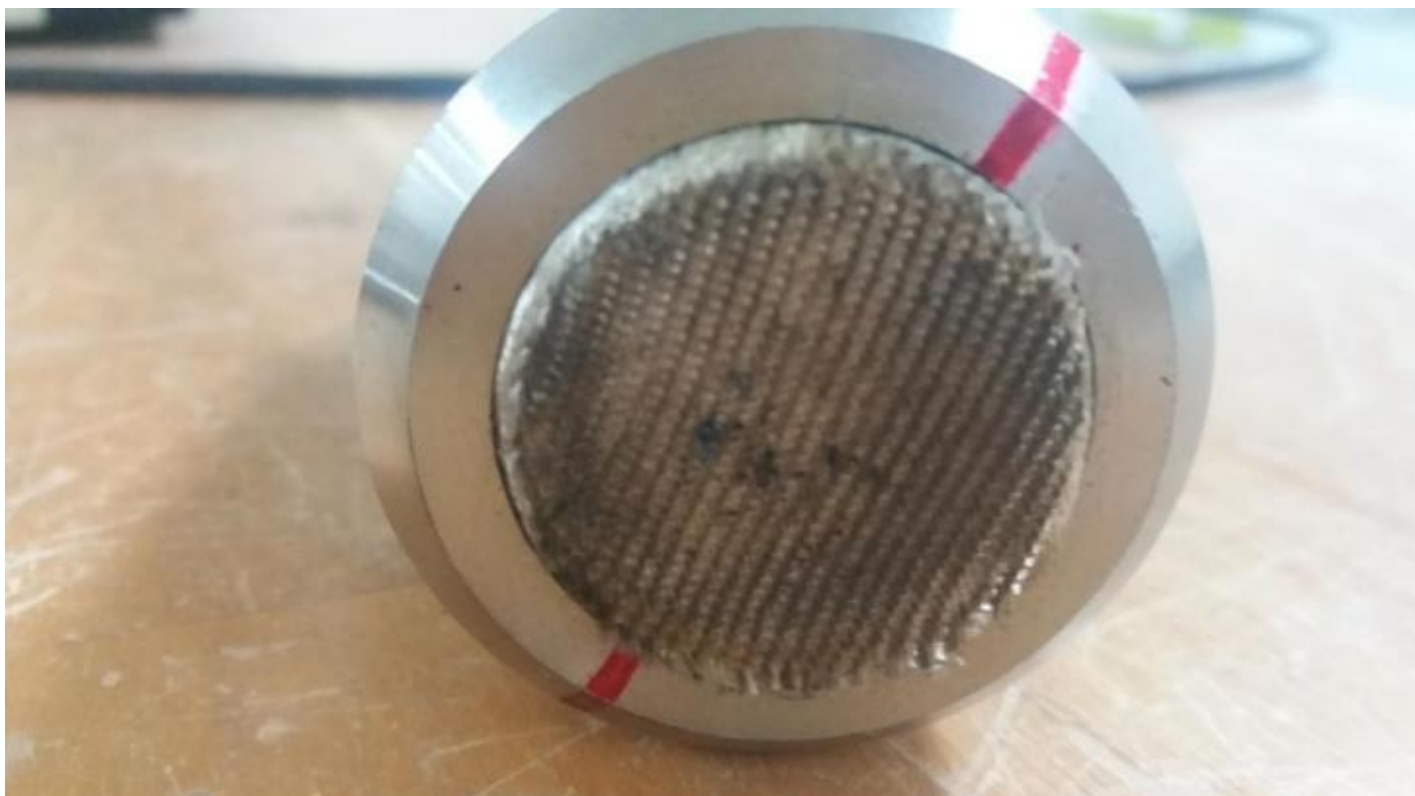


Fig. 6 Figure 6 showed the probe surface outlook after tested at 700C.



Fig. 7 Figure 7 showed the probes surface outlook after tested at 800C.

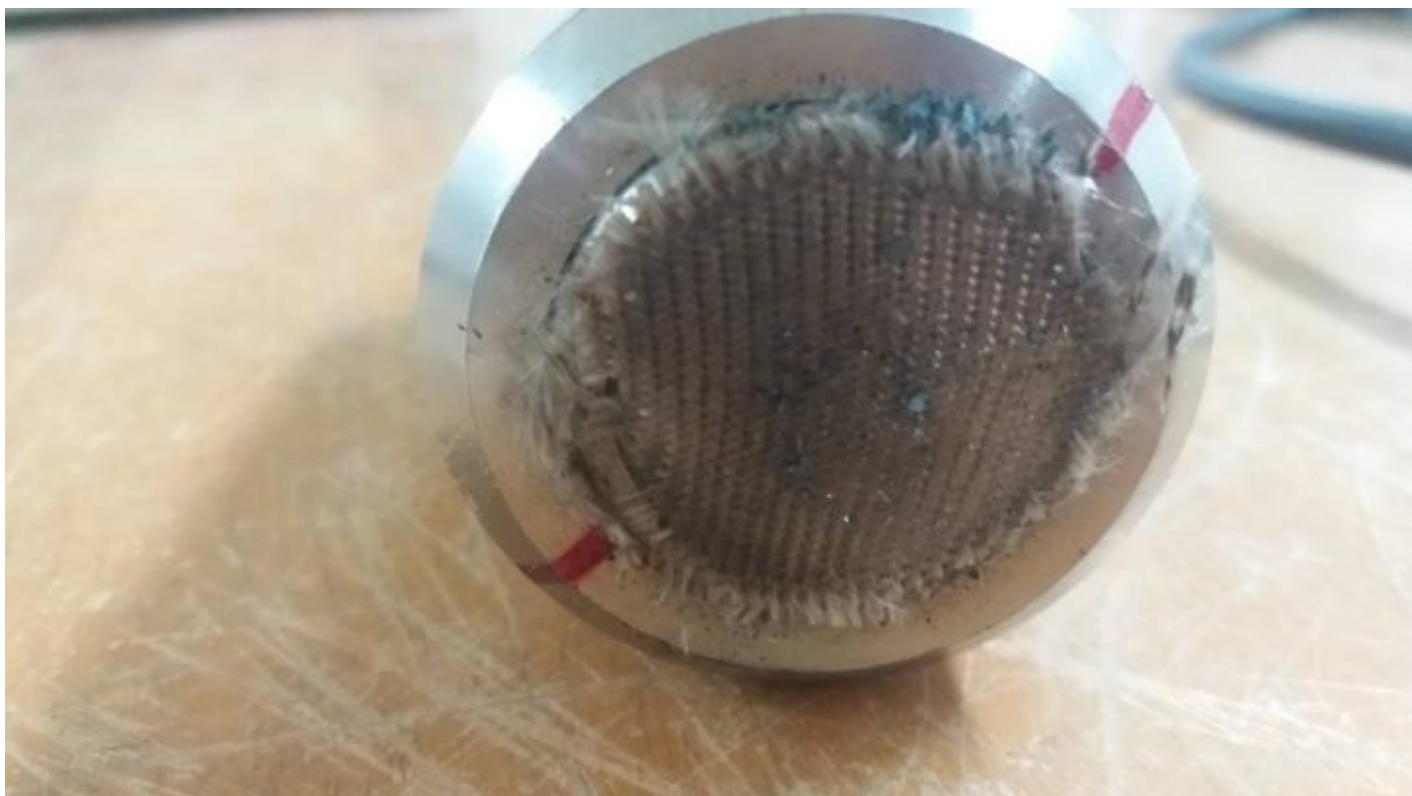


Fig. 8 Figure 8 showed the probes surface outlook after tested at 860C.





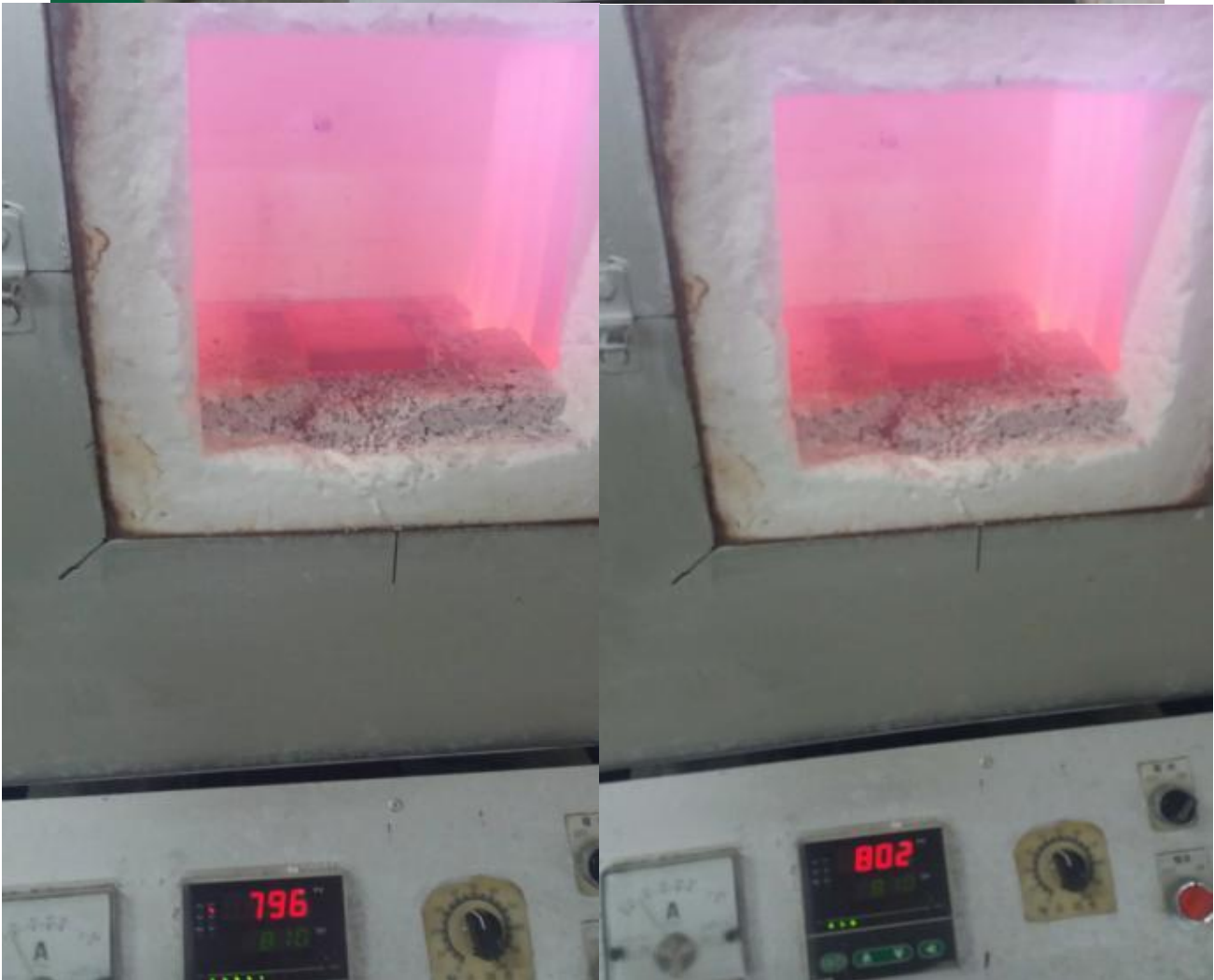


Figure 9 Figures showed the furnace was heated to 800 C (over 800 C) and the surface status of the tested specimen.





Figures 10 Figures showed the surface outlook after testing at 860C and then removing the white composite protection layer.



Fig. 11 Figures showed the probes surface outlook after tested at 200C (without composite protection cloth).



Fig. 12 Figure showed the probes surface outlook after tested at 400C (without composite protection cloth).

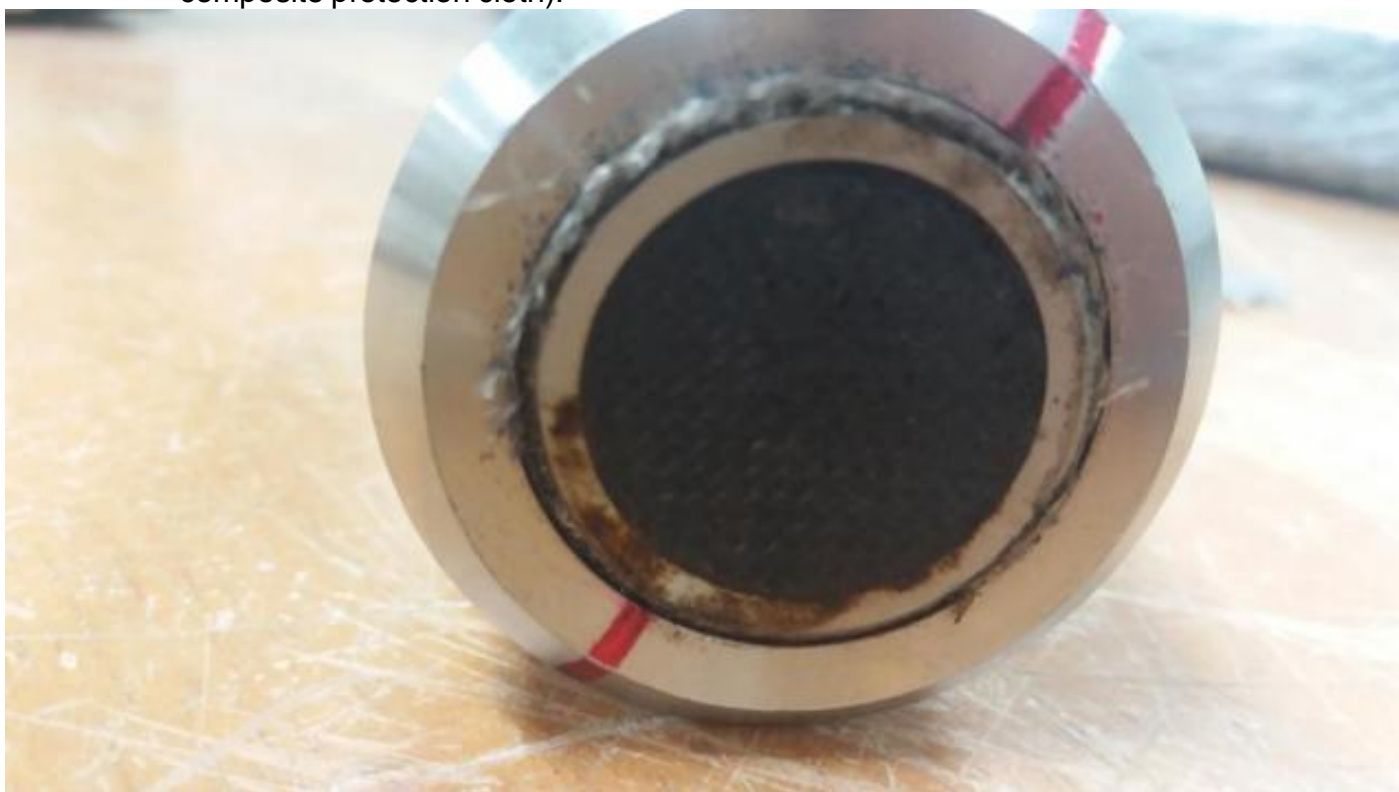


Fig. 13 Figure showed the probes surface outlook after tested at 600C (without composite protection cloth).

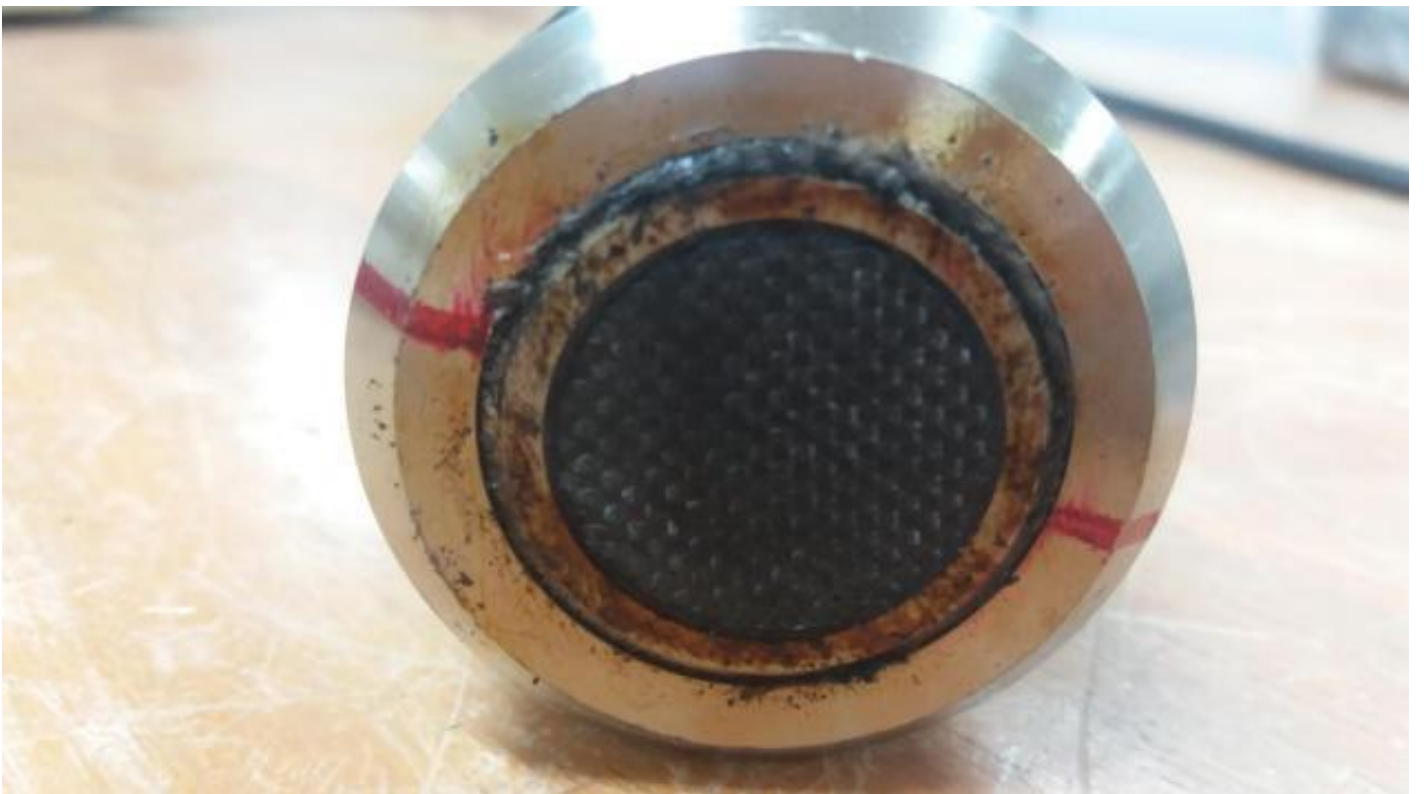
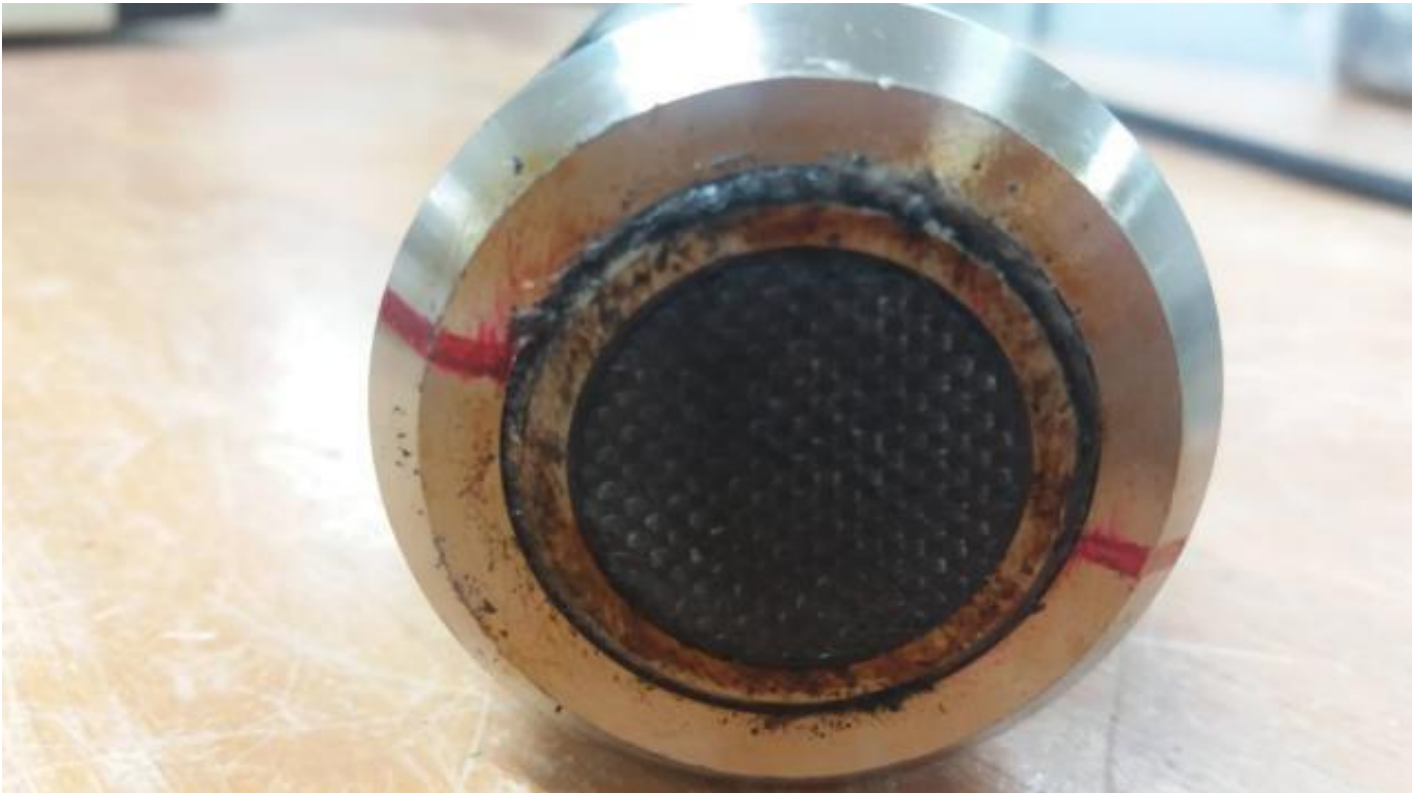
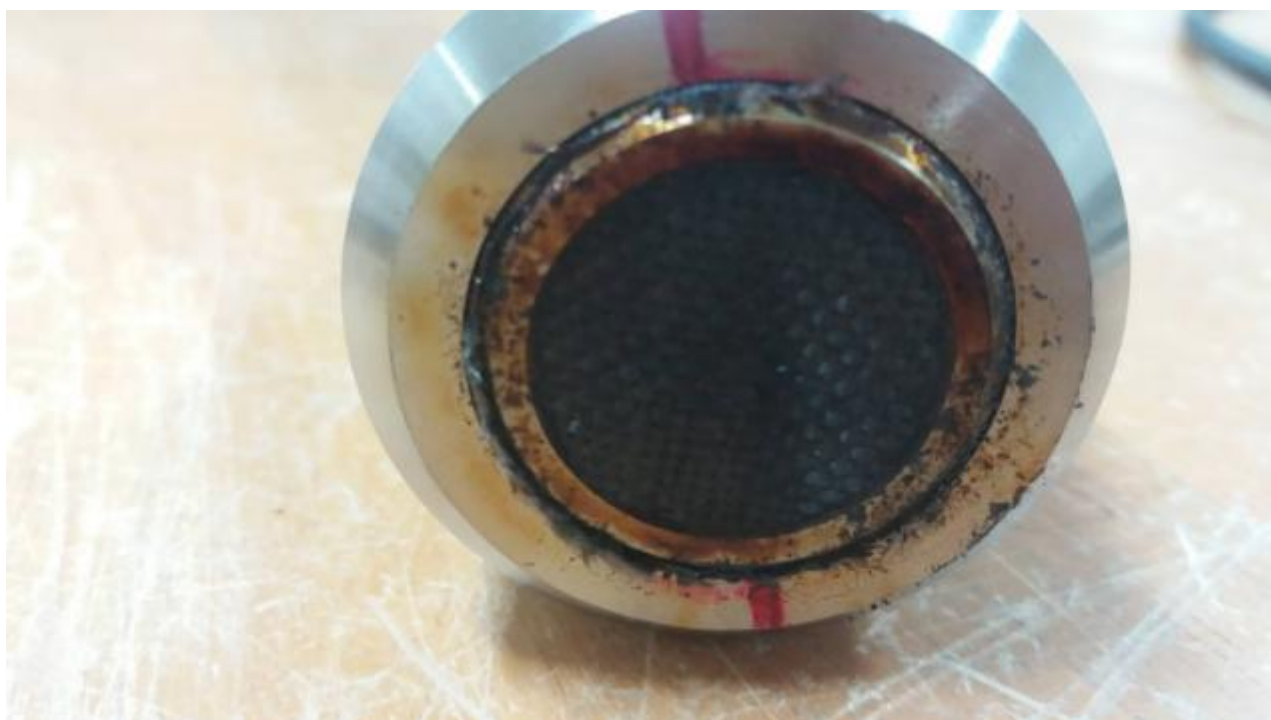
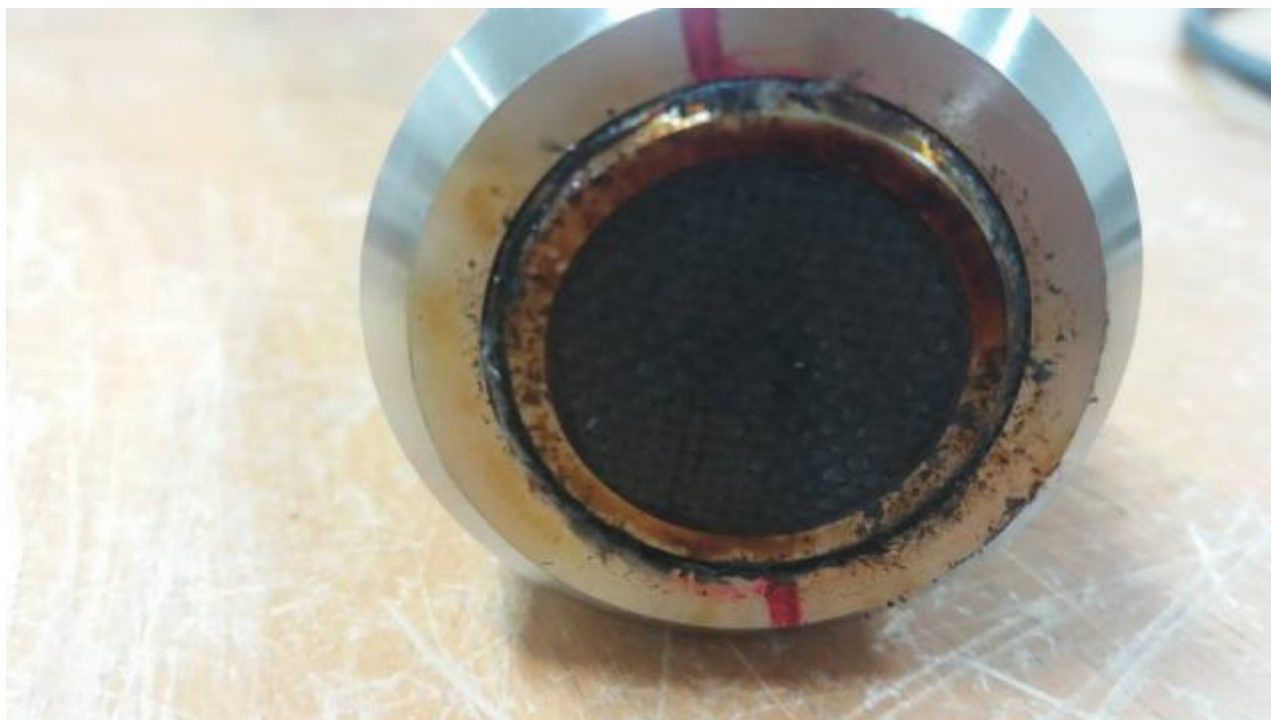


Fig. 14 Figures showed the probes surface outlook after tested at 700C (without composite protection cloth).



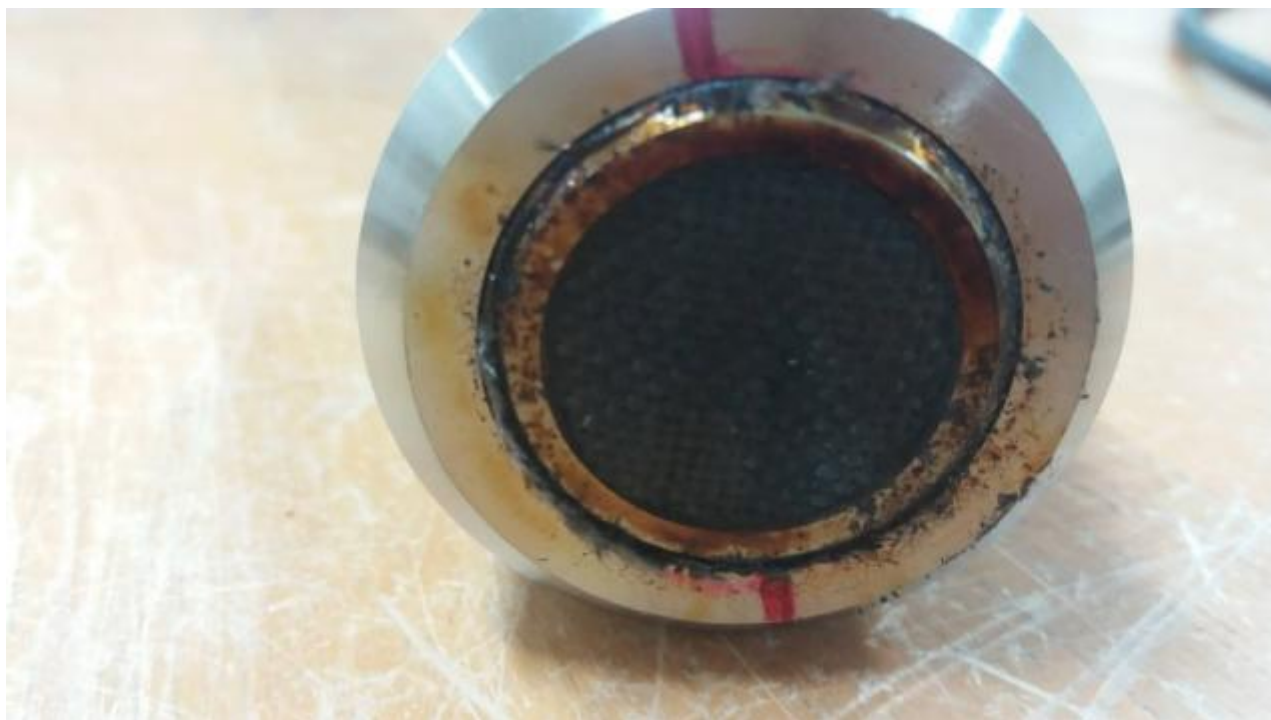


Fig. 15 Figures showed the probes surface outlook after tested at 800C and over 800C (without composite protection cloth).

After tests at HT up to 800C and over 800C with and without composite cloth protection on surface, the tested A1270 EMAT probe (with new surface protection layer) could work normally to measure the thickness at RT.

3. Summary and Conclusion of HT Test

1. After testing up to over 800C with and without protection FRP layer, the surface layer made of new protection layer showed the contacting surface remaining sound and could function well.
2. with composite protection cloth on probe surface :
 - (1) At 200 C, no problem for all the probes, even the surface outlook was nearly not affected. At 400C-600C, no problem for all the probes, the surface showed somehow brown traces. At 800C, no problem for all the probes, the surface showed black traces.
 - (2) After finishing the tests at 800C removing white composite cloth, it showed the surface layers remained nearly no influence.
 - (3) The tested probe functioned normally at RT after testing up to 860C.
3. without white FRP composite protection cloth on probe surface (for probe with new surface protection) :
 - (1) At 200C and 400C, no problem for all the probes, the surface outlook remained the same before testing at 200C and 400C
 - (2) At 600C, the surface layer started to show somehow a melted brown viscous liquid (like sticky on the surface. The molten brown and sticky liquid did not influence the function of tested probe and the surface layer remained sound and well except the brown color of the sticky glue-like liquid on it.
 - (3) At 800C, still the EMAT probe with new protection layer remained sound and complete and function well.
 - (4) Compared to previous EMAT probe with new surface protection layer, the tested probe at this HT test showed no influence on the probe performance was found except the trace of sticky liquid left on the surface after testing at temperature over 600C ,
 - (5) Same as previous test, the new protection layer could function normally at RT for UTM, after the tests over 800C

Summary :

- 1. The testing results showed the new protection surface layer can be used for HT surface contact over 800C with or without additional FRP composite cloth protection.**
 - 2. The testing was done for short time. Long term high temperature contacting is not suggested.**
 - 3. All the tests were done for contacting the hot surface for short time (within seconds) and left surface immediately while measured thickness was shown on A1270 screen. To contact the hot surface again was done after few - 10 seconds of first contact.**
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