The Study of Modelling Inductive Heting Utilization the Joining Technique of ”fretaj”

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Abstract *- The paper refers to a technology of achieving bimetallic combination by processing structure in an electromagnetic field of medium frequency.*

The numerical model used in this study is based on the finite element model and is destined to the study of heating by induction in volume of cyllindrical feromagnetic steel structure whose properties vary with temperature and suffer phase transformation at Curie point.

Keywords: *fretaj, electromagnetic field, inductive heating, heating process bimetallic components*

Introduction

Fretaj technology of two materials is based on the exterior structure heating up to 800° C, then the inductor feeding is stopped. The interior cyllindrical feeding is stopped.The interior cyllindrical structure is introduced, the transfer of heat towards the assembly interior being realized through thre phenomena of thermic conduction.

Due to the expanding of the exterior structure , during the inductive heating process, its interior diameter will grow, allowing the introduction in this phase of an interior cyllindrical structureAt the cooling of the exterior structure, by thermic transfer towards the interior one, this is contracted , causing pressure to the interior one.Due to this fact , a pressure force of exterior structure to the interior one appears, which in the cas of a well controlled process leads to the structural combination of the two materials.

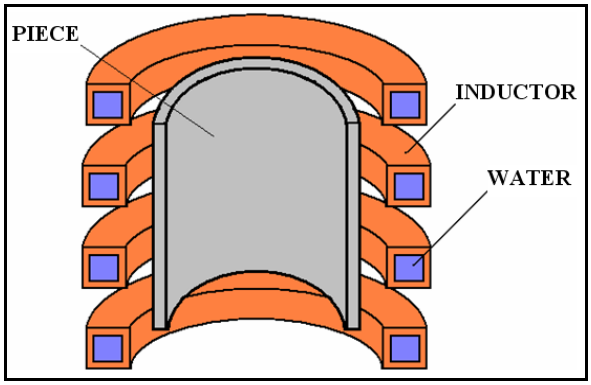

FIGURE 1. *Modelled structure*

The distribution of the temperature field, in the heated piece, represents one of the most important parameters that were followed during the study.That is why we will present the results obtained after modellation and simulation of the heating process.

To maintain the possibility of results comparison the time steps where analysis was made are 1s, 4s, 10s, 20s, and 30s.

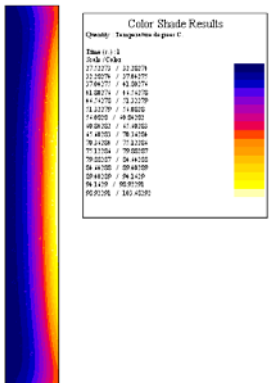

FIGURE 2. *Distribution of thermic field at time moment 1 s and work frequency 2500Hz*

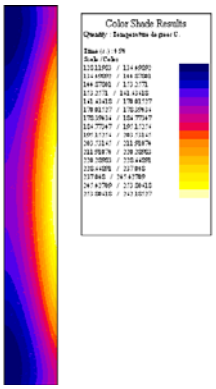

FIGURE 3. *Distribution of the hermic field at 4 s and work frequency of 2500Hz*

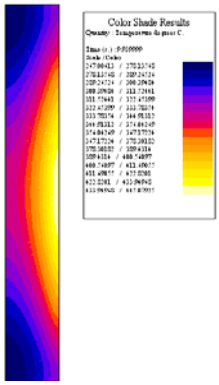

FIGURE 4. *Distribution of thermic field at 10 s and work frequency 2500Hz*

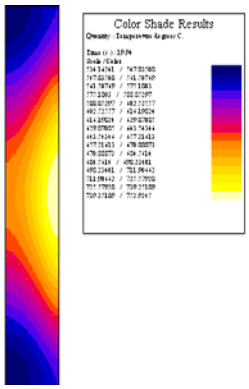

FIGURE 5. *Distribution of the thermic field at 20 s and work frequency 2500Hz*

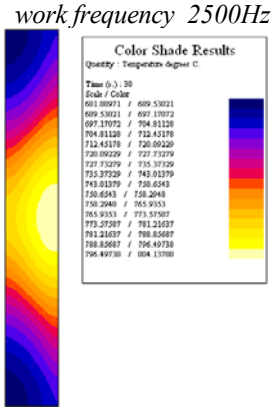

FIGURE 6. *Distribution of the thermic at 30 s and work frequency 2500Hz*

In this paper, heating by turbionary currents and exterior pipe expanding for achieving the diameters differences neccessary for the freatare procedure. The temperature field in this piece was obtained by solving the problems linked to quasistationary and thermic diffusion electromagnetic field.The heating is made at ahigh enough temperature , so that the expanding leads to such a diameter difference that allows the introduction of the interior pipe in the exterior one, even if during the handling the temperature of the exterior pipe decrease.

The value of the fretare diameter is about 16.4 s.

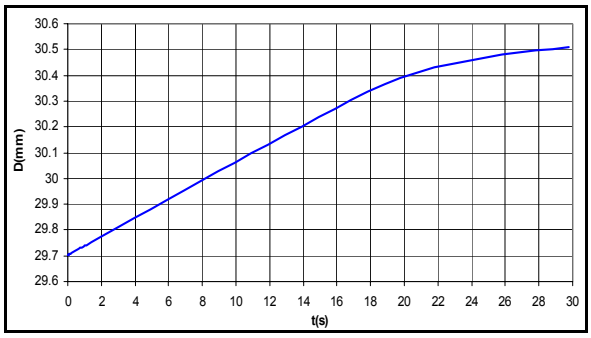

FIGURE 7. *Interior diameter of exterior pipe*

Conclusions

The above results show that the analysis proposed in this paper allows the adoption of the most convenient work frequency and values of the current density.The hypothesis that the frequency increases too much it is possible that the pellicular effect can be so pronounced that ins ahort time after the current appliance the temperature in certain areas of the piece increase a lot , the average temperature remaining unsufficient to achieve the fretare diameter.

The mechanic combination through thermic process are often used in practical applications that is why the research of the heating process by metal pieces induction imposed for the improving of the phenomena of electromagnetic conversion and distribution of the electromagnetic field, linked to the thermic one in the structures subjected to heating.

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