

## CAST IRON PROCESSED BY ELECTRICAL EROSION

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**Summary:** *Erosion processing power is a method for treatment of materials by direct electric current in a working fluid. It is an unconventional method for heavy metal processors. EDM phenomenon consists in the deployment of material at a distance from one another and between which there is an electric potential difference. Introducing the two parts (part that is intended to be processed and the tool that will perform the processing - where cars thread wire or electrode in a car with massive electrode) in a liquid dielectric phenomenon is amplified because the arc is produce between tool and work piece material by local vaporization creates a gas bubble. This creates, in dielectric fluid, a plasma bubble that quickly raise the temperature of the area around 8000-12000°C and that increases and accelerates the phenomenon of displacement of molten material in the surface of the two electrodes. When the potential difference between tool and work piece is interrupted, the sudden drop in temperature causes the gas bubble implosion, creating dynamic forces which have the effect of design molten material out of the crater formed. The amount of material displaced by erosion of the electrode and the piece is asymmetric and depends heavily on certain parameters like : polarity, thermal conductivity , melting point of the material that makes up the piece and electrode characteristics and current applied between the electrode track.*

**Keywords:** *cast iron, elements, electrical erosion, materials.*

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## 1. INTRODUCTION

Electrical discharge machining called erosion processing power, is already used on a large scale in manufacturing, sharpening and hardening tools, forming dies processing, execution micron diameter holes, after cutting complex profiles, removing broken tools (taps, drills). Use electrodes profiling tool corresponding to the surface generated by the processing: for holes of different shapes in the form of a stamp electrode, the cutting electrode in the form of a rotating disc or tape or wire with the translational movement. The electrode-tool is connected to the cathode of the pulse generator frequency. In alloys with iron, carbon can be found in two states: bound carbon compound defined Fe-C iron carbide called cementite and free carbon as graphite. When the changes in the cooling takes place so that carbon is linked to the system is metastable, cementite is unstable and decompose on heating. If changes take place such as to cause the separation of carbon in the form of graphite, the system is stable. If these alloys eutectic transformation occurs after stable diagram and eutectic transformation can be done for both the chart and after the metastable stable. Gray cast irons differ only in the form of nodular graphite irons. Obtaining nodular graphite is achieved by adding some elements (magnesium, calcium, lithium cast iron corresponding liquid composition having a gray cast iron. Nodular graphite is much less unfavorable influence on the resistance characteristics of the material, whereas the interruption of the base metal mass is smaller than in the case of gray cast iron, where the graphite strips act as notches. Gray

and nodular cast irons have a structure consisting of ferrite base board, which are laminated to the formation of graphite in the nodular gray and globular. Nodular pearlitic and pearlitic gray cast irons are made of pearl metallic mass which are formations of graphite. If this font eutectic reaction after diagram arising stable and metastable diagram for eutectoid reaction. Metal Broad gives them good mechanical strength, obtained directly from the hardware. Gray and nodular cast irons have weight pearlitic ferrite-pearlite and ferrite formed metal that are formations of graphite. Ductile cast iron is an iron alloy with a silicon - carbon - graphite structure . Ductile cast iron is that cast iron, the graphite is present in the form of strips . Under the action by a major effort, each blade can lead crack formation . Why gray iron shows a brittle behavior . Cast iron still have some outstanding features : compressive strength , fatigue resistance , corrosion resistance . Ductile or nodular iron is obtained by controlled introduction of a small amount of magnesium in cast iron desulphurisation in advance. In ductile cast iron , spherical graphite crystallized form which eliminates the risk of spreading cracks or tears . Ductile cast iron gray iron is different in its structure and in addition to the quality gray cast iron has the following additional features: high limit of elasticity, elongation importance , shock resistance , tensile .Cast iron shows a brittle behavior. Ductile cast iron is flexible and deformable without the risk of rupture.

**2. TECHNOLOGY AND CAST IRON MATERIALS PROCESSED BY ELECTRICAL EROSION**

For the realization of the experiment was used electrical erosion machine AR-1300 (figure 1).

The AR series wired Novick can process complex objects such as molds, rims, components, marine, automotive, aircraft, gears and other hard objects processed. You can plan and oblique cut work pieces with a maximum size of 1300x900mm and a height of 500mm. CAD-CAM programming system allows operators to automatically execute the program by drawing directly to the screen or entering waters DXF files from a source external CAD.



Figure 1: Electrical erosion machine AR-1300

In figures 2-21 are shown in the various structures of cast iron processed in electrical erosion machine AR series.

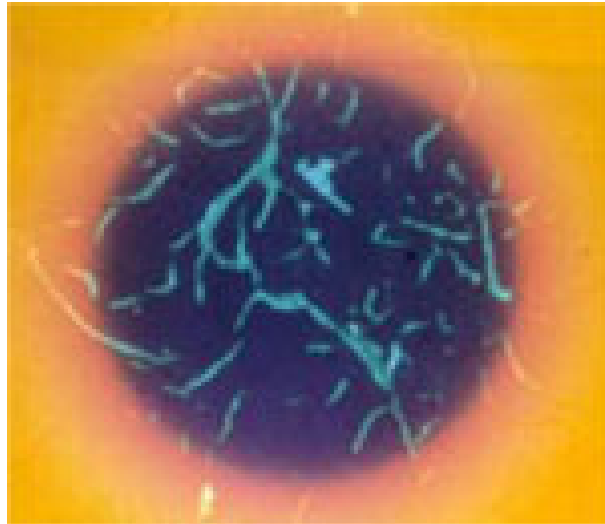


Figure 2: Ductile cast iron

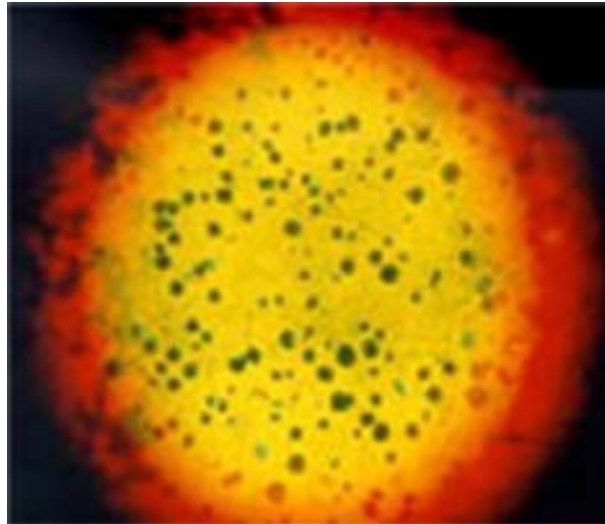


Figure 3: Ductile cast iron

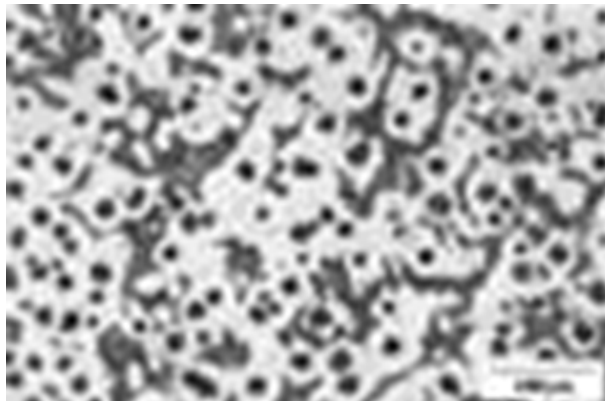


Figure 4: Cast iron composition Fe, 3.52 C, 2.51 Si, 0.49 Mn, 0.15 Mo, 0.31

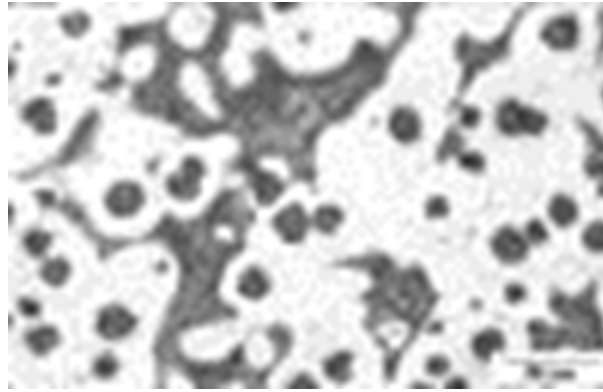


Figure 5: Cast iron composition Fe, 3.52 C, 2.51 Si, 0.49 Mn, 0.15 Mo, 0.31

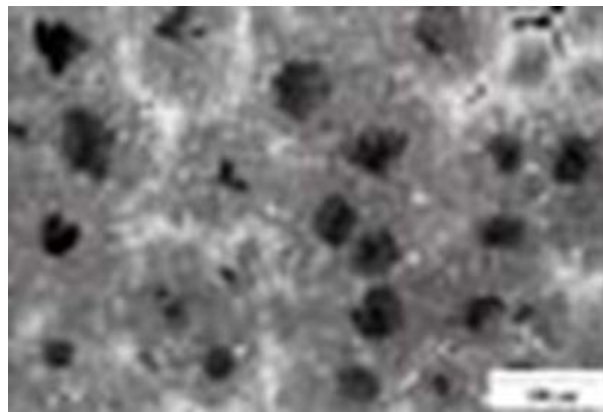


Figure 6: Cast iron composition Fe, 3.52 C, 2.51 Si, 0.49 Mn, 0.15 Mo, 0.31

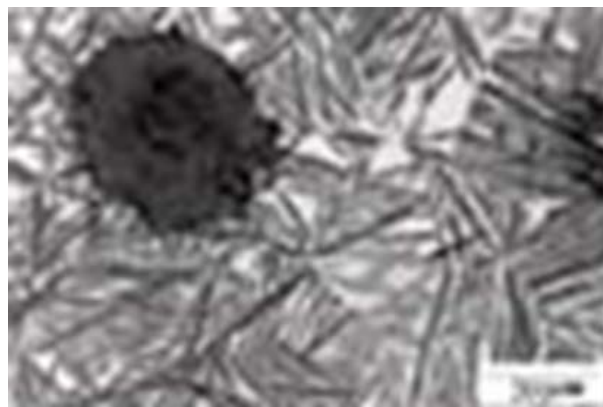


Figure 7: Cast iron composition Fe, 3.52 C, 2.51 Si, 0.49 Mn, 0.15 Mo, 0.31

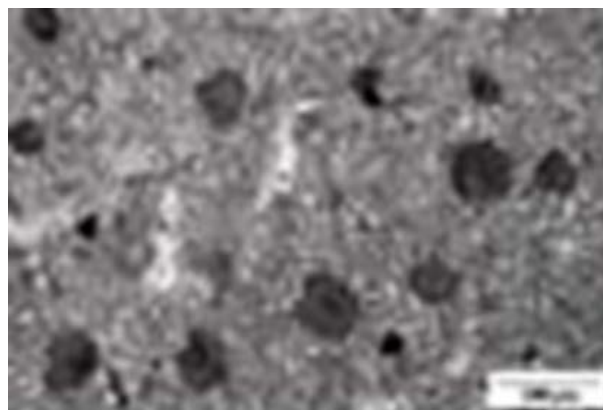


Figure 8: Cast iron composition Fe, 3.52 C, 2.51 Si, 0.49 Mn, 0.15 Mo, 0.31

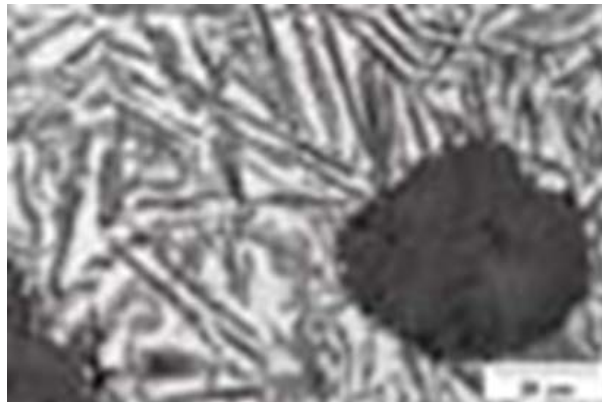


Figure 9: Cast iron composition Fe, 3.52 C, 2.51 Si, 0.49 Mn, 0.15 Mo, 0.31

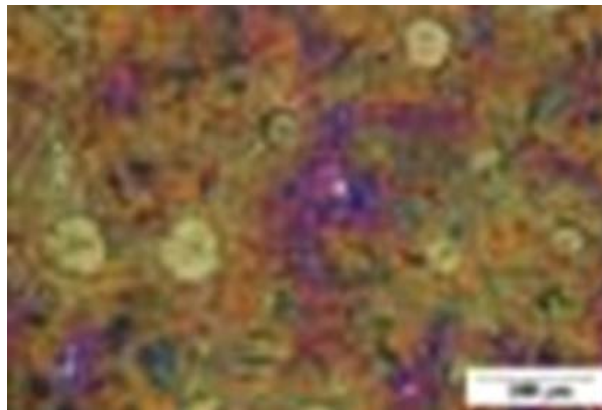


Figure 10: Cast iron composition Fe, 3.52 C, 2.51 Si, 0.49 Mn, 0.15 Mo, 0.31

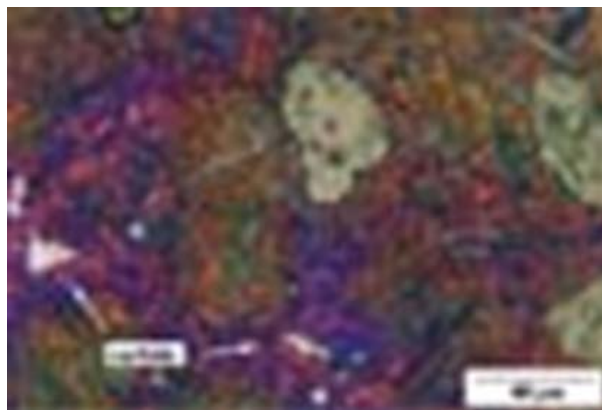


Figure 11: Cast iron composition Fe, 3.52 C, 2.51 Si, 0.49 Mn, 0.15 Mo, 0.31

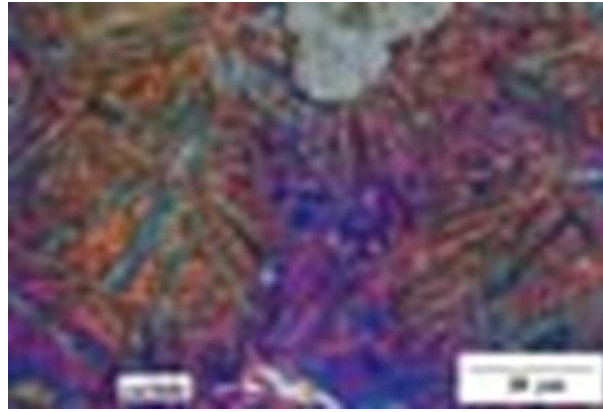


Figure 12: Cast iron composition Fe, 3.52 C, 2.51 Si, 0.49 Mn, 0.15 Mo, 0.31

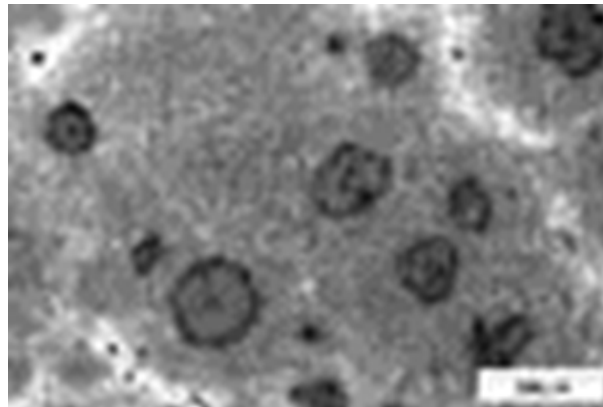


Figure 13: Cast iron composition Fe, 3.52 C, 2.51 Si, 0.49 Mn, 0.15 Mo, 0.31

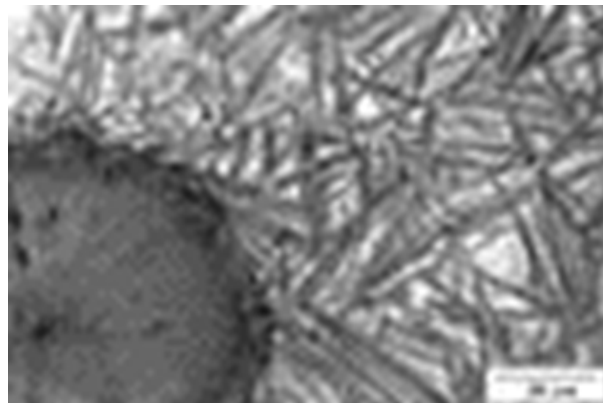


Figure 14: Cast iron composition Fe, 3.52 C, 2.51 Si, 0.49 Mn, 0.15 Mo, 0.31

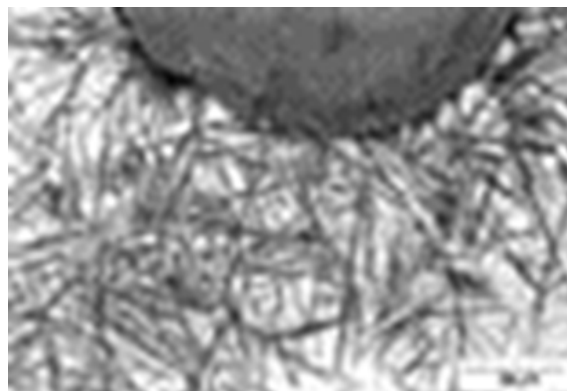


Figure 15: Cast iron composition Fe, 3.52 C, 2.51 Si, 0.49 Mn, 0.15 Mo, 0.31

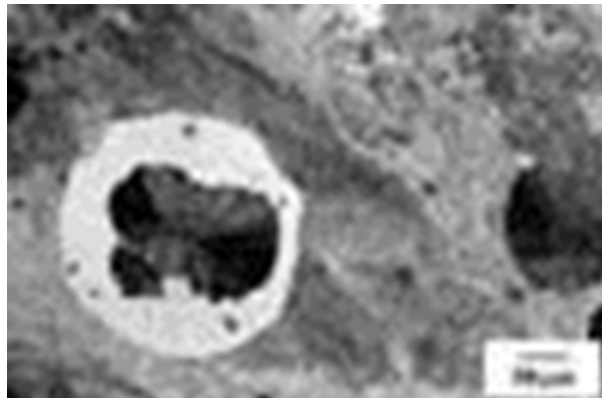


Figure 16: Spheroidal graphite iron Fe, C 3.2, 2.5 Si, Mg 0.

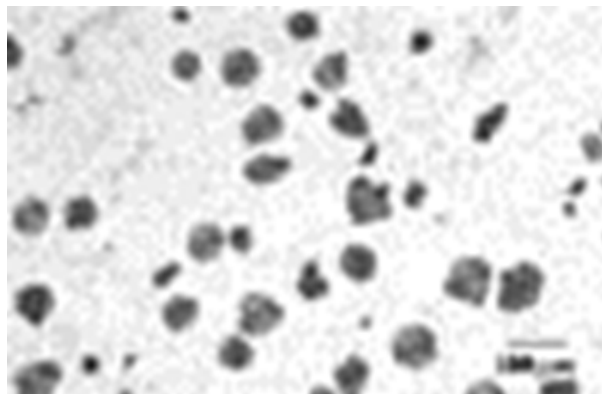


Figure 17: Spheroidal graphite iron Fe, C 3.2, 2.5 Si, Mg 0.

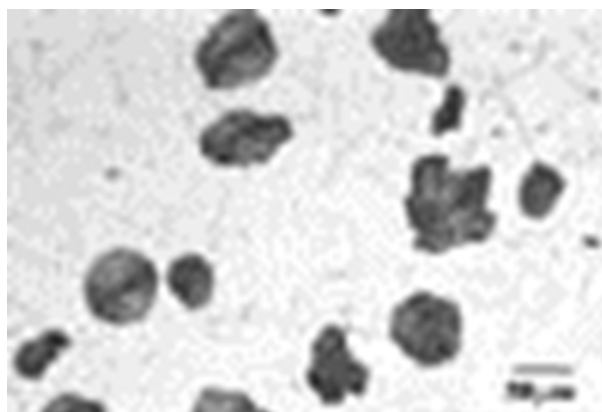


Figure 18: Spheroidal graphite iron Fe, C 3.2, 2.5 Si, Mg 0.

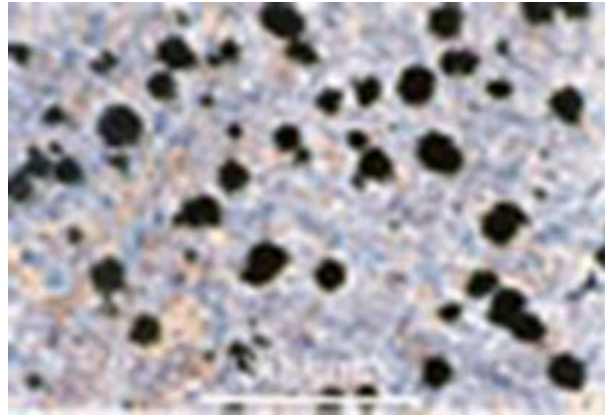


Figure 19: Pearlitic malleable cast iron system, C 2-4

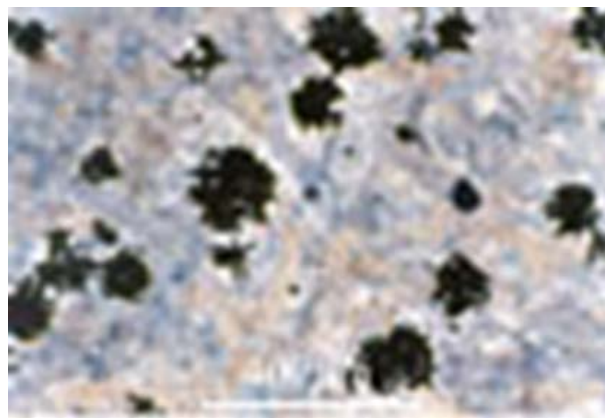


Figure 20: Pearlitic malleable cast iron system, C 2-4

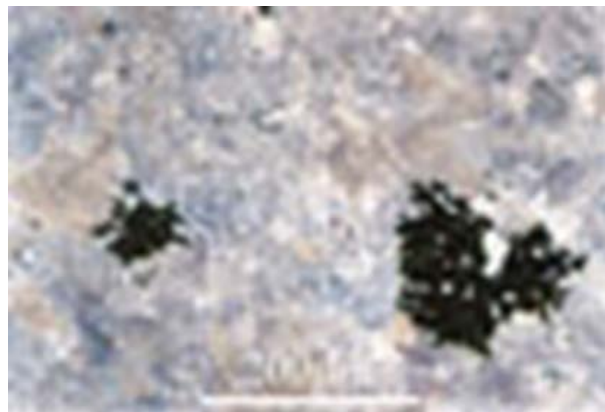


Figure 21: Pearlitic malleable cast iron system, C 2-4.

### 3. CONCLUSION

These cars use a molybdenum wire for each electrode and adopt a type thread rolling processing benchmarks. Geometric accuracy of the machined parts can reach  $\pm 8\mu\text{m}$  and the rough surface best  $R_a = 0.9 \mu\text{m}$ . Ductile cast iron (spheroidal or nodular cast iron) replaced the use of cast iron in the manufacture of pipes and fittings. Ductile iron has a tensile strength more than double the usual cast (420Mpa to 180sqm). Easy to splice



can be installed in any weather conditions and often without requiring an embankment. To high resistance factor and factor of safety and quality to adapt to any soil movement has made material for manufacturing ductile iron pipes and their use in a wide range of applications. Cast irons features: high strength, high safety factor, resistance to vibrations.

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