

The Cycle of Abrasives in the Process of Cutting of Materials Abrasive Waterjet Technology within the Logistics Companies

Ciklus abraziva u procesu rezanja materijala abrazivnom mlaznom tehnologijom u logističkim kompanijama

Monika Karková

Department of Mechanical Engineering
Institute of Technology and Business
České Budějovice, Czech Republic
e-mail: karkova@mail.vstecb.cz

Ján Kmec

Department of Mechanical Engineering
Institute of Technology and Business
České Budějovice, Czech Republic
e-mail: kmec@mail.vstecb.cz

Daniel Kučerka

Department of Mechanical Engineering
Institute of Technology and Business
České Budějovice, Czech Republic
e-mail: kucerka@mail.vstecb.cz

DOI 10.17818/NM/2016/SI12

UDK 338.3:504

Preliminary communication / Prethodno priopćenje
Paper accepted / Rukopis primljen: 21. 3. 2016.

Summary

Today, stalked company is defined as an industrial. Technologies are developed and refined, and this leads to innovation in the field of environmental protection and logistics. Environmental protection as a concept is quite lengthy and includes several areas. This article deals with the life cycle of materials technology at cutting water jet from the award of the contract to the finished product.

KEY WORDS

abrasives
cutting
waterjet
environmental protection

Sažetak

Danas se logistička kompanija smatra industrijskom. Tehnologije se razvijaju i profinjuju a to dovodi do inovacija u polju zaštite okoliša i logistike. Zaštita okoliša je koncept koji je poprilično dug a uključuje različita područja. Ovaj članak bavi se cjelovitim ciklusom tehnologije materijala prilikom rezanja mlaznom tehnologijom od sklapanja ugovora do završnog proizvoda.

KLJUČNE RIJEČI

abrazivna sredstva
rezanje
mlaz vode
zaštita okoliša

1. INTRODUCTION

Water makes up 71% of the Earth's surface. It ranks among the renewable energy source that may be used for long periods without significant environmental damage. Use of water for technological purposes and for landscaping dates back to the times ancient Rome and elements of the applications can be found in the period of the pharaohs.

The force of water in the form of a water jet is able to share a wide spectrum of materials of vegetable starting material, and through the skin to steel and cast iron. It defined as materials technology division cold and therefore do not arise in her unwanted material deformation by heat.

In addition, the water is used in the separation of materials and abrasive. Natural materials in the form of fine sand, which are finite and therefore pays attention being re deposited into the splitting process.

chamber is tapered abrasive tipped nozzle through which the water coming out of the form of a water jet.

The addition of abrasives such as cutting medium is made only in the separation of solid materials. When finer material is used pure water jet [1], [2].

Cutting equipment is CNC (numerically controlled machines) machine operated command entered in CAD programs (computer-aided design in the form of technical drawings). Cutting tables are equipped with a cutting head, sliding benches and an external computing device which controls the cutting. Tables are designed to poison or more cutting heads. They are in two versions, namely hidden or open. Covering the tables ensure the protection of the environment and employees.

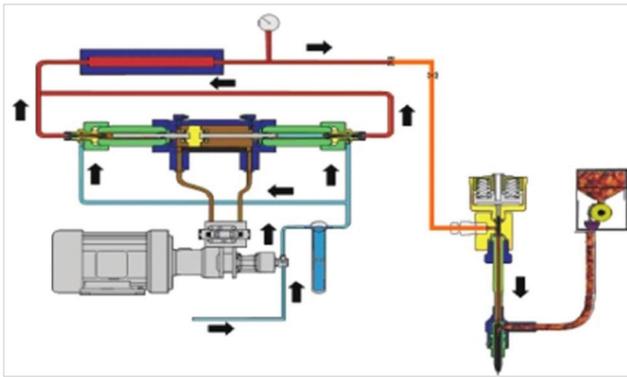
2. CUTTING OF MATERIALS OF WATERJET AND ABRASIVE WATERJET TECHNOLOGY

Cutting water jet (Figure 1) is a process that is in itself a particular sequence of steps. The main part has a high-pressure pump, which drives the water and forms the pressure needed for the conduct of the operation. The water is transferred by means of a transport tube from the container of water through the pump, the dispenser up to a water jet into the mixing chamber. The

3. MATERIALS USED TO WATERJET CUTTING

The materials used in this technology are water and abrasive. Water cutting as a medium must meet the essential criteria of that it can be used for cutting.

Water treatment with pure water and abrasive water beam increases the quality of work product quality, equipment life, reduce repair, the wear rate of nozzles, control valves. The water used in the separation technology of water jet must be free of iron and calcium.



Source: [1]
Figure 1 Principle Hydro abrasive cutting of materials

From the abrasive material, the most frequently used is garnet (Figure 2) of size # 80 MASH grains in the range 0.18 to 0.35 millimeters. It has high durability and roughness on the Mohs scale no. 8th

From a usability perspective, this type of abrasive is most acceptable. Garnet can be re-used after recycling. Its grains are using break and raises the sharp edges that can cut materials. After use, the edges become dull, thereby reducing the grain size. Recycling is simple and does not alter the chemical composition of abrasives [1], 3-5].



Source: authors
Figure 2 Garnet Indian, Mesh # 80

The use of a suitable type of abrasive material in the cutting process depends on a number of factors. One of the most important factors is the availability and price. For abrasive quality is often pay a high price, but this speaks volumes about its quality and purity. It is important to avoid abrasive containing silica (causing silicosis) and thereby increase the risk of the operator. Its consumption is between 0.1 to 1 kg / min. The whole interface is associated with the type of pump and nozzle in this technology. Quality abrasives us brings increased cutting speed, higher accuracy, minimal clogging nozzles.

4. LIFE CYCLE MANAGEMENT OF MATERIALS

Product Evaluation by LCA (life cycle assessment hereafter LCA) analysis today is an important step in protecting the environment. The method includes in its assessment of the consumption of energy, materials, health workers, steps from receiving raw materials through the production of a product, its distribution, and consumer use to recycling or disposal.

That method is viewed from sustainable sources is:

- pollution prevention,
- protection of natural resources,
- environmental ethics.

LCA analysis of the production system and seeks to minimize negative impacts on the environment. The value of its inputs and outputs within the production process by applying environmental policies and innovative practices in the process of reducing output in the form of emissions and other negative impacts.

The article deals with the analysis of a single input material, and only in the process of exploitation. Solve total life cycle is comprehensive and lengthy. Therefore, this article addresses the issue of abrasive flow (Figure 3) and the recycling cycle of abrasive material (Figure 4) in the process of exploitation. This is the abrasive material used in the separation of materials abrasive water jet.

The process begins with the delivery of abrasives supplier in the required quantity and packaging. Material is heading to the store and from there into the manufacture of dispensers abrasives. In production is the quality of the abrasive through a metering device to get the material to cut [2], [6].

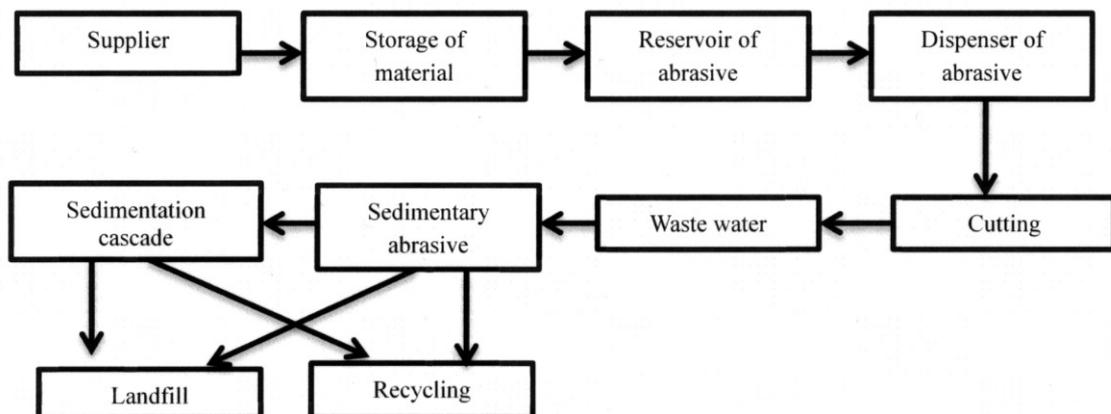
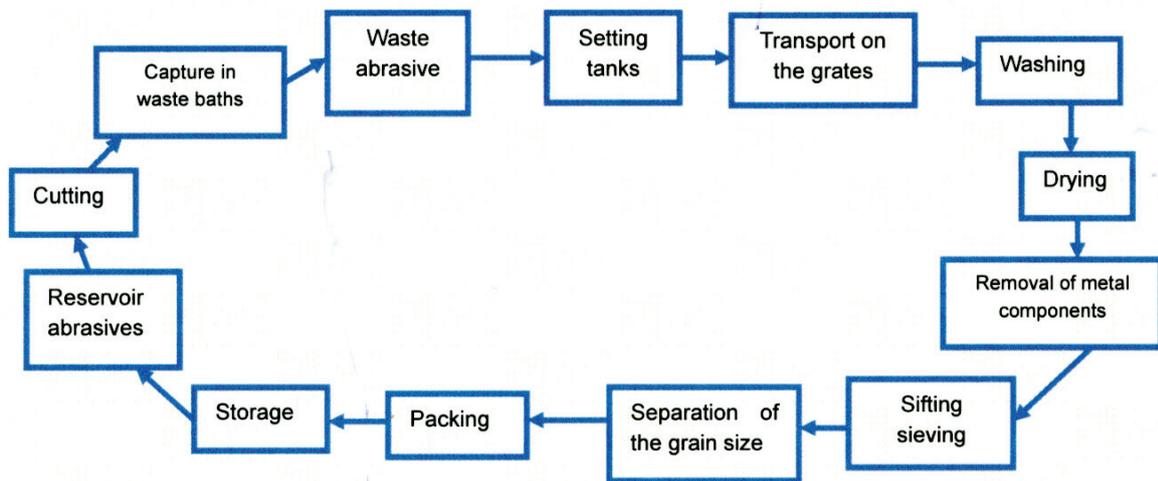


Figure 3 Flow abrasive in the process



Source: authors

Figure 4 Recycling of abrasives

When cutting, waste is generated in the form of scrap and uses the abrasives. Used abrasive is collected into the waste tub where the abrasive settle. The water is discharged through the settling tanks and sedimentation cascade and purified from the residual abrasives. Separate abrasive is then either recycled or removed to landfills.

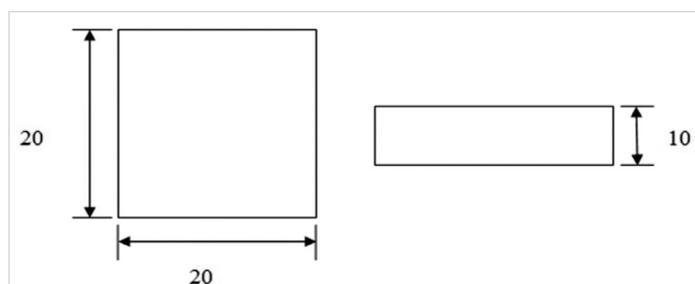
Separate abrasive in the case of recycling, then it gets on the conveyor slats. On the grate abrasive washed and

decontaminated. Washed abrasive is heading into the dryers. The dried abrasive is kept free of metal particles of cutting material. Clean abrasive goes on dividing workplace. The dividing workplace abrasives sifted through special sieves that separate the abrasive grains by size. So classified abrasive is packaged and stored until distribution to customers or reuse [5-7].

Table 1 Basic parameters of the experiment

Constant parameters	
Sample size	20x20x10 mm
Cutting direction	-Y, +X, +Y, -X
Type of materials	Stainless steel 17 240 AISI 304
Material thickness	10 mm
Water pressure	300 MPa
Angle of incidence of the beam on the material	90° perpendicular to the material
Type of abrasive	GARNET
Mesh #	80
Variable parameters	
Cutting speed	50; 75 mm/min.
Amount of abrasive	200; 250 g/min.
Water nozzle	0,25; 0,30 mm
Abrasive nozzle	0,76; 1,02 mm
The distance from the nozzle material	4 mm
Measured - evaluated parameters	
Edge Roughness [Ra]	-
Middle Roughness [Rq]	-

Source: authors



Source: authors

Figure 5 The shape of the experimental samples

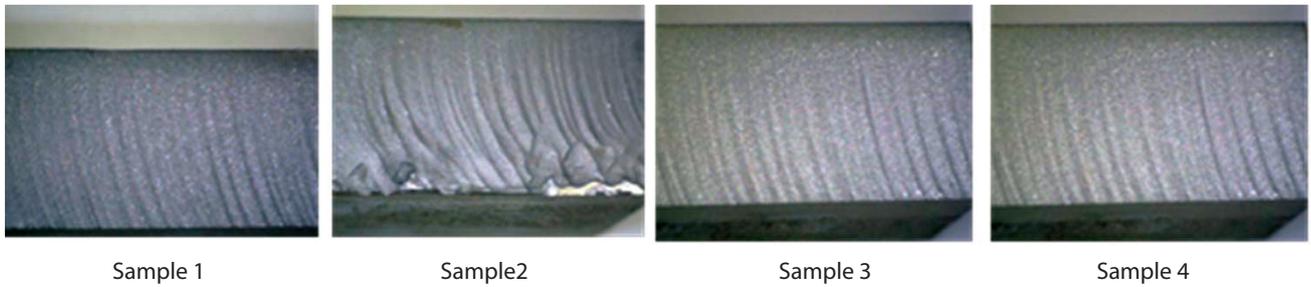


Figure 6 Cutting quality individual samples

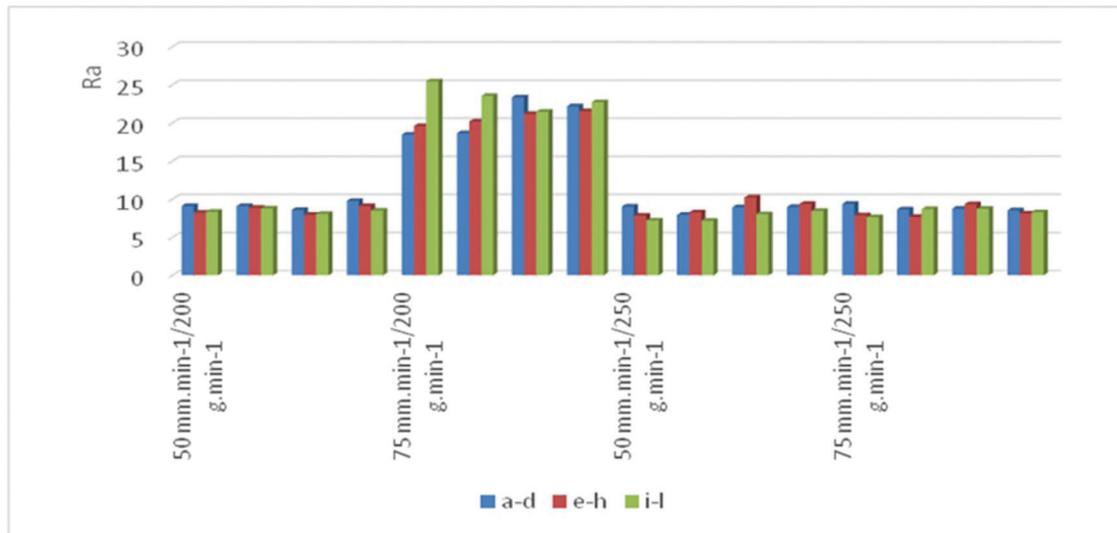


Figure 7 Dependence surface roughness parameters for constant cutting speed and feed abrasives

5. EXPERIMENT

In the experiment, there were cut 4 experimental samples at the setting of the parameters (Table 1). Cutting was realized under the same conditions three times. 48 examined the surface of the samples, each set of samples was cut at a different flow rate and another abrasive.

Samples were sculpted in the form of a cube measuring 20x20x10 (Figure 5)

Cut sample is then examined for metering devices. They looked specifically surface individual samples and compared to the quality of the cut.

The experiment was based on clearly specified methodology and comparing the quality of the cut in the combination of speed and cut the flow of abrasive, which was examined as it can save a tributary of the media in the cutting process. FIG. 6 is an example of surfaces for each combination [5], [8].

Sample 1: Cutting speed: 50 mm / min flow rate of abrasive: 200 g / min

Sample 2: Cutting speed: 75 mm / min flow rate of abrasive: 200 g / min

Sample 3: Cutting speed: 50 mm / min abrasive flow rate 250 g / min

Sample 4: Cutting speed: 75 mm / min abrasive flow: 250 g / min

The result of the experiment is to confirm the quality of the cut in the particular combination of speed and abrasive flow. For this experiment, it is provides a common environmental

model and reassured the hypothesis that the abrasives can be recycled several times and it is still possible to cut materials. After a multi-stage recycling to using abrasives adds new, thus improving the quality of the cut, which in turn confirms that logistically positioned properly recycling facilities it would bring down the costs of buying a new abrasives and become less dependent on suppliers [2], [5], [9].

6. CONCLUSION

Water jet technology is still developing and trying to adapt to the ecological and economic requirements. Found its application in all industries. By dividing food through, the engineering industry cooperates with the construction industry.

Recycling methods can again return to the abrasive cutting process. According to the identified knowledge, abrasive accounts for 50% of the total companies. Re-use of recycled abrasives, the company will reduce costs by an estimated 1/3 of the total cost [2], [10-12].

The cycle of abrasives in the process by managing the life-cycle in manufacturing contributed to the environmental friendliness of production and to reduce company costs. Eliminate the disposal costs and reduce the negative environmental impact in terms of minimization of waste itself.

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