## MACHINING OF ENGINE BLOCK CARRIER

### Kolarec Martina, Duspara Miroslav, Stoić Marija, Stoić Antun, Jagnjić Mario

*Keywords: machining, aluminium, 4th axis machining center* 

#### Abstract:

Particle separation treatment is one of the most important manufacturing technologies in modern industry. Particle separation machining is performed on a machine tool with predetermined tools to produce a product of satisfactory quality in the shortest possible time.

CNC control or computer numerical control is the control of machine tools using encoded commands (instructions) that are loaded on the control computer.

In the CNC system, the microprocessor enables the modification of the computer program on the machine, which also enables the modification of the program during machining, which allows great flexibility in operation as well as saving time.

Each CNC machine is controlled by a control unit and a special computer program (software). The most used control unit is SINUMERIK 840 D.

## **1 INTRODUCTION**

An example of a processed piece is the engine carrier. The main role of the engine carrier is to connect the engine and the vehicale body. Because of their essential function and the tasks they perform, these pieces must be of extremely good quality and precisely crafted.





For example of machining pieces I take a four-axis CNC machining center for the serial production of smaller pieces. The piece is machined on two types of CNC machines CHIRON

Material workability is a complex term, and it is described as a basic technological feature that expresses the suitability of workability of a material, tool, machine tool that has an impact on the processing process. It can be said that the workability is reflected as a result of many different actions of the cutting process factors, in relation to the cutting modes (speed, shear and depth of cutting). workpiece material and geometry material and tool geometry coolant and lubricant (SHIP)

Aluminum is a shiny metal of silver-white color, with high thermal and electrical conductivity. Its melting point is  $660 \degree C$  and its boiling point is  $2519 \degree C$ . As a metal it is soft, tough, low density  $(2,700 \text{ kg} / \text{m}^3)$  and easy to cut. Metal is very reactive, but thanks to the thin transparent layer of airformed oxide, it makes it corrosion-resistant. It is resistant to substances that destroy oxide film, for

example alkali, mortar and constructin lime. Aluminum does not have high strength but with the process of precipitation hardening, it is possible to produce high strength aluminum.

# 2 METALLURGICAL TREATMENT AND THE PRINCIPLE OF MOLD PREPARATION

Melt preparation is performed on rotors. Some rotors do not have automatic dosing, so additives as well as purifier and titanium need to be added manually. Manual addition of the additive is done with the grabber Ø140, and approximately 1 kg of additives fit into the full grabber.

The temperature of metallurgical preparation of the melt is 700 - 750  $^{\circ}$  C.

The AlSi7Mg03 (Na) mixture is used for position engine carrier. The residual slag that is inflamed when cleaning the casting pot must be removed. This is followed by the filling of the furnace for the maintain of melt. The following is the addition of Na-F, SILEXIL, Mg. It is necessary to degass the melt and perform thermal analysis by sampling one of the furnace per shift.

#### 2.1 Machine working procedure

There is a specific mounting on the machine for the piece. Montage works on the principle of hydraulic clamping, which is suitable for repeatability and process stability. The machines allow accuracy and repeatability, and it is possible to produce large quantities (100, 1000 or more) of exactly the same products at once or occasionally. Differences that can occur between products are usually negligible due to the wear of tools and machine parts. On classic machines this is not possible. Part of the product won't even meet the quality needed.



Figure 2. Position of pieces on montage chiron



Figure 3. Position of pieces on montage makino

Before mounting of the positions, it is necessary to deflate the mounting so that no scrapings remain on the contact surfaces and damage the treated surface. It is necessary to remove the remaining flakes on the treated surfaces with a scraper.

Once the piece is mounted and clamped, it is sent for processing. The processing method is defined in the NC program. The program calls the cutting tools provided for machining .

PCD C	GLODA	LO Ø5(	) R5									
PCD C	GLODA	LO Ø32	2 R2									
SVRD	LO Ø11	,8/Ø14	h6 + KV	JT								
SVRD	LO Ø7,	8/Ø12h	6 + KU	Т								
PCD R	AZVR	FAČ Ø8										

Table 1. Used tools

### "ENGINEERING TECHNOLOGIES IN MANUFACTURING OF WELDED CONSTRUCTIONS AND PRODUCTS, SBW 2019"



Figure 4. Used tools

When finished, the program turns the table, the outside table goes to work, second goes out for the workpiece.

The following is a procedure for removing the assembly piece, cleaning the chip piece and the emulsion or cooling fluid.

After cleaning, a random inspection of the pieces with controls is carried out to determine the comfort of the workpiece. Also during production the pieces are mesured with a 3-d coordinate device. Diameter control, internal thread diameter, drilling depth, thickness are controled. After inspection, the piece is ready for conditioning.

"ENGINEERING TECHNOLOGIES IN MANUFACTURING OF WELDED CONSTRUCTIONS AND PRODUCTS, SBW 2019"



Figure 5. Chiron-vertical axis

### "ENGINEERING TECHNOLOGIES IN MANUFACTURING OF WELDED CONSTRUCTIONS AND PRODUCTS, SBW 2019"



Figure 6. Makino-horizontal axis

The machine has two tables, one on which the workpiece is processed, and other is for preparation, placement. The machines are highly adjustable because they can make a larger or smaller series of products or just one product, and then simply load another program and create another product.

It is possible to produce very complex shapes, the use of numerically controlled machines makes it possible to produce and construct such complex shapes and products that were not economical to produce before.

METROL	OGIC AGEN SHIPE TECHNOLOGIES IN WELDED CONSTRUCTIONS AND	MANUFACTURING OF PRODUCTS, SBW 2019"
LIST OF	CONTROLLERS	

NUMBE R	CHARACTERISTICS OF	VALUE		MEDIUM CONTROL					
		MIN .	MA X.						
1.	DIAMETER Ø62 (+0,009/+0,046)	62,009	62,046						
2.	DIAMETER Ø33,88 (0/+0,084)	33 ,8 8	33 ,9 64	ETAMIC					
3.	CORE THREAD M8x1,25-6H	-	-	TLD A4145- S					
4.	THREAD M8x1,25-6H	-	-	TFD A4146-					
5.	DIAMETER Ø9±0,3	8, 7	9, 3	TLD A4147- S					
6.	DIAMETER Ø55,7 0/+0,8	55,7	56 ,5	TLD A4148- S					
7.	DIAMETER Ø11,8 ±0,2	11 ,6	12	TLD A4152- S					
8.	DIAMETER Ø32 ±0,5	31 ,5	32,5	TLD A4153- S					
9.	KOTA 16 ±0,15	15 ,8 5	16 ,1 5	CAM US4056-S					
10	KOTA 21 ±0,15	20 ,8 5	21 ,1 5	CAM US4100-S					
11 ·	DIAMETER Ø8,15H8 (0/+0,022)	8, 15	8, 17 2	ETAMIC					

# "ENGINEERING TECHNOLOGIES IN MANUFACTURING OF

#### WELDED CONSTRUCTIONS AND PRODUCTS, SBW 2019"

12			DRILLING DEPTH Ø9±0,3 →												$\rightarrow$		4,        5,      G				GAI	GAB							
•			5±0,3											7 3 US4152-						2-S									
13			DRILLING DEPTH Ø8,15H8 $\rightarrow$ 1										10	10				-			GAI	B							
•	MINI																			US4	103	8-S							









Figure 9. TFD



Figure 10. ETAMIC

When performing an ethamics control, it is necessary to rotate the etamic 180° to obtain the correct control (frequency of the 1/1 ethamic control)

During production, after the piece has been released from the machine, visual inspection is performed to detect any deviations.

After machining, the pieces go to marking where the DMC (content represents position number, ie identification number) code is printed on the piece itself.

![](_page_10_Picture_6.jpeg)

Figure 11.

Each pallet must be labeled with the total number of pieces contained in the boxes on the pallet. Pay attention to the cleanliness and correctness of the packaging, check that there are no shavings or other impurities in the packaging! Make sure the label is printed correctly and that all signs are clearly visible. After machining, it is delivered to the customer, and the product is then assembled on the assembly line.

## **3** CONCLUSION

The paper describes the process of machining the engine carrier particles on a CNC machine.

The procedure and sequence of processing, controls, purpose, as well as the material used to make the piece are briefly explained.

Numerical control makes it possible to achieve accuracy, precision and high quality of the machined surface. The advantage of particle separation treatment is the very small change in material properties. The downside is the need for a large space for tool placement

machines.

### **4 REFERENCES**

- [1] Šavar Š., Obrada odvajanjem čestica I dio, Zagreb, 1977
- [2] Stephenson, David A. : Metal cutting theory and practice, Second edition,
- [3] CRC Press, Boca Raton, 2006