## **ECOBRASS... THE NEW BIG FRONTIER OF BRASS** FAUCETS, FITTINGS, PIPE AND VALVES SECTORS EXTEND THEIR FRONTIERS.

n the last years and above all with the beginning of 2013 different experts of the faucet, fittings, pipe and valves sectors engaged themselves in the research and in the consequent improvement of new material use. Actually these materials have to conform to international standards in terms of environmental compatibility consciousness and of environmental respect. The material connected to this research is ECOBRASS: a particular brass alloy in which there is no presence of lead, which is considered a highly polluting element and that it has been years since they tried

to get rid of it in different sectors such as petrol and pipes. Let us mention as an example, that the law NSF 61 (concerning pollution of drinkable water with heavy metals) has been in force in the U.S.A. already since 90s; amendments to the Safe Drinking Water Act (SDWA connected to connections and connectors which are on the market without lead after 6th August 1998) have been activated in Canada since 1996; in Europe we are behind but the law 98/93 CE concerning the contamination of waters for human consumption is a reality and starting from 25th December 2013 the selling of



materials containing lead will be forbidden in the mentioned sector. In detail ECOBRASS is a new material which comes from brass and has a high percentage of copper and absence of lead. During the research PORTA SOLUTIONS interfaced with different Customers. who explained that, at the moment, they are attached to a traditional machining of materials with lead as it is considered easy to machine. In addition it does not require particular high spindle motor power and the very short chips avoid the

forming of nests on the tools. But, from their point of view, machining ECOBRASS can involve limits so they try not to use this material even if it will become compulsory machining non-polluting materials.

Our interviewees complained about the following points:

- Request of higher spindle power;
- Very long chips;
- Request of higher stiffness than traditional brass machine.

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For this reason the cooperation between PORTA SOLUTIONS and WALTER reinforced in order to constantly search for new parameters of effective particular. machining. In nowadays the efforts are concentrated on ECOBRASS in order to improve the production in the faucets, fittings, pipe and valves sectors. At the beginning we tried to understand and to point out which main features a machine tool should have in order to correctly machine this kind of material. Then we focused on the tool technical features for the ECOBRASS

machining. Finally PORTA | SOLUTIONS worked out an ad hoc machine with suitable features for the machining of this material, through data and statistics of different tools. Before listing the technical features of the machine, on which the test was carried out, as well as the technical features of the relative tools. we hereby mention the technical chart of the material which the test parts are composed of. This is a material with similar and compatible technical features to ECOBRASS and its EN name is: CW511L (CuZn38AS), an anti-

dezintificating alloy which has a hot plasticity comparable with the one of CW602N alloy and very poor tool workability mainly due to a high copper content. Hereby it is the technical chart of the mentioned alloy:

IS0	EN	UNS	ELEMENT	Cu(%)	Pb(%)	Zn(%)	Other Element(%)	STANDARDS	
CuZn40	CW509L	C27450	Min. Max.	59,5 61,5	- 0,2	Rem.	-	Free machining Rods	EN12164
Cuzn42	CW510L	-	Min. Max.	57,0 59,0	- 0,2	Rem.	-	Forging Rods	EN12165
CuZn38As (DZR BRASS)	CW511L	-	Min. Max.	61,5 63,5	- 0,2	Rem.	As:0,02-0,15	Profile	EN12167
ECOBRASS (PATENTED)	CW724R	C69300	Min. Max.	73,0 77,0	- 0,09	Rem.	P:0,04-0,10 Si:2,7-3,4Element(%)	Hollow Rods	EN12168

Remark: At nourishment equipments the max. limitation is %0,05 Pb for all symbols

Mechanical Properties	Tensile Strenght Rm (N/mm²)	0,2%Proof Strenght Rm (N/mm²)	Elogation A (%)	Brinell Hardness (HBW)
CW509L	450	290	25	130
CW510L	500	330	20	150
CW511L (DZR BRASS)	400	250	30	120
ECOBRASS CW724R	670	400	20	160

Physical Properties	Density (g/cm³)	Thermal Conductivity (W/Mk)	Electrical Conductivity (%IACS)	Normal Elasticity Modulus (Gpa)
CW509L	8,4	121	28	105
CW510L	8,4	110	27	105
CW511L (DZR BRASS)	8,4	123	28	97
ECOBRASS CW724R	8,25	33	7,8	85



After having listed the material features, we focus on the machine which machines it. Let's discover together the five points:

- 1. Bridge shaped machine frame. Necessary for having extreme machine stiffness. Actually the machine acts definitely in a stiffer and better way in comparison with ordinary machining centres. Basically in the machining center configuration the higher the part is clamped, the more the vibrating and elasticity problems are highlighted due to the missing stiffness of the MULTICENTER bridge machine frame.
- 2. Spindle motors with nominal power of 18 kW. This request is connected to the fact that the material to machine has some chemical and mechanical features that are not constant. For this reason it is indispensable having a margin of power to transfer to tools (in order to machine this material).
- 3. High pressure coolant through the spindles. In order to machine this kind of material, the proposed configuration is equipped with high pressure coolant: in this case it becomes a high necessity. Of course this feature is indispensable in order to solve the problem with particularly long chips that are produced. On the other hand it is important also because this material that, in comparison with the standard brass, requires definitely higher power absorption on the spindles, has to be machined.
- 4. It is required a minimal lubricating pressure through the spindle and tool of 40 bar. The request of such minimal pressure is connected to the chip evacuation.
- Big area of chip evacuation. An important evacuating area is necessary since the chip produced during the machining is not always perfectly broken.



Of course, what was explained is really important but that is not all. Actually we carried out other test types by using different tool types and obtaining extraordinary different results. In a first moment we carried out the test by using some standard tools which are suitable for a particularly good machining of traditional brass. With this tool type we noticed limits in the machining, in particular in the chip evacuation. Actually lots of parts were found marked also by operations of superficial finishing carried out with very low speed since the chip, which interposed between the tool and the part, completely damaged the inner part surfaces. In addition these limits were noticed also in using the tools with inner coolant passage. At this point WALTER ITALIA came into play proposing us a solution for roughing operations where both a higher power and an increase of characteristics of chip breaking are required. Our partner supplied us a tool with the following features:

- Special tool code: B2074-6388930;
- Standard insert code: CCGT120408-PM2 WXN10.

The special tool for the ECOBRASS machining consists of the following points and parameters:

Working parameters:

- Motor power 18,5 kW;
- Drive ratio 1:1.5;
- Dedicated clamping fixture with low barycentre.

Cutting parameters used for roughing Ø78mm and bottom spot-facing of part in CW511L. Boring Ø78mm: >>

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- Vc: 180 m/min. (735 rpm);
- Feed: 0.4 mm/rev.;
- Note: excellent chip breaking. Bottom spot-facing of Ø78mm (depth 5mm – insert machining section 28mm):
- Vc: 44 m/min. (180 rpm);
- Feed: 0.15 mm/rev.

After having assimilated the parameters and the dynamics of tool machining, we carried out the same machining tests and we obtained exceptional results both in the part surface quality (despite we were making a roughing operation) and in the correct chip evacuation.

Clearly, also the spindle power absorbing felt the positive effect, since this tool was realized with dedicated standard mechanical clamping inserts. We hereby report some results and some images related to the various comparative tests which were carried out at PORTA SOLUTIONS with the cooperation of WALTER ITALY:

- 1. Parts carried out on the spindle with transmission ratio 1:1. Some parts were necessary for testing the tool cutting parameters. We succeed in obtaining a stable machining without vibrations. The finishing durina the roughing step (with Walter tool) is excellent, while the final finishing (tool for traditional brass obtained with braze-welding tool is very bad. The limit is probably to impute to mchips that accumulate inside the part and the parameters set in the machine, which are not suitable for the machining of this material.
- 2. Parts carried out on the spindle with transmission

ratio 1:1.5. All the traditional tools vibrate with the same cutting parameters. We tested other cutting parameters but the situation did not get better. Despite the margin of the higher torque, we noticed more machining limits. This demonstrates the considerable complexity material machining. of Actually the tools for the traditional brass machining do not work properly.

3. Only the roughing operation with the supplied tool by Walter was carried out on other new rough parts in working station with transmission ratio 1:1.5. By carrying out the machining, the absorbed power and the spindle work perfectly.



Measuring starting from the full rough part: It can be noticed that the peak of the power absorbed by the spindle motor is around 40 Amperes and the spindle works for the whole distance with a constant revolution number. If we proceed with a different machining, i.e. with a tool suitable for machining the traditional brass, here is what we get: measuring taking only 0.5mm on the bottom away. It can be noted that the power peak is the same (blue colour) but the spindle rpm decrease till zero (red colour). So by taking only 0.5mm away, the Z axis cannot accelerate to the expected feed speed causing a misalignment between rpm and feed which generates the decrease of spindle revolutions. Actually an important feature of this material, noticed during the test, is that it tends to reject the cutting edge if an aggressive feed is not used requiring machining powers definitely high. We noticed also some vibrations that we solved with the correct cutting parameters. This is to demonstrate also that, despite we are machining a brass material; the powers at stake are too far from the standard.

The results of the research carried out by PORTA SOLUTIONS and WALTER ITALIA are decisive in order to approach to the ECOBRASS machining in an easier way, eliminating complications and chemically damaging to the environment substances. In addition to the strict cooperation of the two parts, we relied on one of our long-time Customer, who supplied us various parts used for the research and the machining into the machine.



know the various research steps since he had had a lot of limits in the correct management of the necessary spindle power for machining the parts in the past. Moreover he was bound by both the part side damage (damaged by chips evacuated by machined parts by mistake) and machine retainer in order to discharge the chips from the tools and from the machine itself. But. how it can be noticed in the image, the machine area remains very clean after the use of the precautions mentioned both for the machine and for the tools proposed by WALTER ITALIA. Actually the final test results demonstrated how the machined material. named CW511L, is more difficult to machine than the traditional brass. Thanks to this research. today ECOBRASS has started to be considered positively in the faucet, fittings, pipe and valve sectors for the machining of every part type. The new big frontier of brass has been opened by "made in Italy" and more precisely by PORTA SOLUTIONS. Now you can start machining ECOBRASS too... Contact us right now! PORTA SOLUTIONS and

The same Customer wanted to

PORTA SOLUTIONS and WALTER ITALIA are at your complete disposal for further information concerning the correct ECOBRASS machining. The reference person at PORTA SOLUTIONS is Eng. Camerin Roberto and you can contact him both by email at the address: sales@porta-solutions.com and by phone at +39 030.89.005.87. Walter Italia is reachable at the e-mail address: service.it@ walter-tools.com and at phone number +39 031.926.111.

Machining with tool for traditional brass (-0,5mm on the bottom)

## ...AND YOU ...HOW DO YOU MACHINE ECOBRASS?

