

THE PRODUCTION OF NON-STANDARDIZED SEMI-PRODUCTS – I. part

Semi-products produced by hot forming

Non-standardized *semi-products* produced by *hot forming* are most often manufactured using *forging*. When we *forge* we change the shape of a future *forging* using pressure or *strokes* on a heated *semi-product* at a *forging* temperature. For steels it is in the area of austenite. We can *forge* manually or by using *forging* equipment. In industrial production mechanical *forging* predominates. We classify *forging* machines according to the acting forces into *power hammers* or *presses*.

Power hammers act on material with *ram* impacts. They make *forge* scale fall off the material, and make the *forging* surface pure. Their disadvantage is that they don't *forge* through material in depth. *Blows* cause the machine and its *surroundings* to shake.

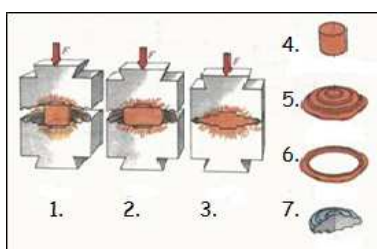
Presses act on formed material using gentle pressure and *forge* through the entire *cross section* of a material. As opposed to *power hammers* work on *presses* is safer and without *blows*.

According to method we classify mechanical *forging* into mechanical *hammer forging* and *drop die forging*.

Mechanical *hammer forging* is a method of processing ingots and semi-finished products using simple *forging* tools - *anvils*, *forge tongs*, *forge chisels* and *recessed shims*. *Forgings* have rough and *uneven* surfaces.

Drop die forging is the method of forming material in tool cavities which are called *dies*. Their shape is the same as the shape of a *forging*. *Forgings* have exact shapes, a better-quality surface and are well *forged through*.

Picture 1- Drop die forging



1. First *stroke*
2. Second *stroke*
3. Third *stroke*
4. *Initial semi-product*
5. *Forging with flash*
6. *Flash*
7. *Forging*

Special methods of hot forming

In addition to mechanical *hammer forging* and *drop die forging* there are other progressive methods of mechanical *hot forming* used for producing *semi-products*. There are for example: *cross-wedge rolling*, *rotational forging*, *hot extrusion* and other methods.

Cross-wedge rolling is used for the production of *semi-products* of round bar sections. A bar is heated using induction, a roll with formed segments rolls out a semi-product and the *trimming tool trims* the *semi-product*.

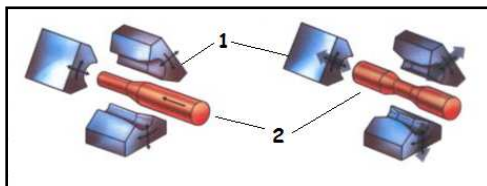
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Picture 2 - Cross-wedge rolling with examples of rolled products



Rotational forging is suitable for profile changes and the **recessing** of tubes and bars.

Picture 3 - Forging in rotation



1. Formed jaw of **rotational forging** equipment
2. **Recessed forging**

Semi-products produced by cold forming

During cold **forming** – **pressing** – we **act** on a material using external forces which leads to a permanent change in material shape. We can distinguish forming into **flat forming** and **volume forming** according to the course of deformation.

Flat forming is the shaping of material without a fundamental change of **cross section**. The mechanical properties of a material do not change.

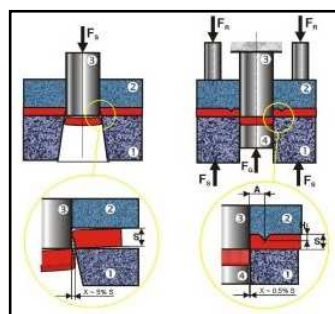
Volume forming is the shaping of material with a change of **cross section** or shape. When we form there is a **solidification** of material and a **drop** in **ductility**

Pressing technology is the name we use for metal processing using **cutting** and **forming**. When we cut we divide the material of the whole **cross section**. When we form we transfer material particles so that there isn't a **disturbance** of **cohesion**.

A summary of pressing technology:

Cutting is the production of products and **semi-products** from sheets or strips using **shears** or **cutters**. **Shears** can be categorized as **table shears**, **belt-slitting shears**, **circular** or **vibrating shears** according to the kind of cut. **Cutters** consist of two main parts: the **trimming die** and the **trimming punch**. **Cutters** are used as simple **cutters**, gradual **cutters**, **compound** and combined **cutters**.

Picture 4 - A cutter



1. **Trimming Die**
2. **Holder**
3. **Trimming Punch**
4. **Ejector**

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VOCABULARY

act	působit	holder	přidržovač
anvil	kovadlo	hot extrusion	protlačování za tepla
belt-slitting shears	nůžky na pásy	hot forming	tváření za tepla
blow	ráz	initial	výchozí
circular shears	okružní nůžky	power hammer	buchar
cohesion	soudržnost	ram	beran
compound	sloučený	recessed	osazený
cross section	průřez	recessed shim	osazovací příložka
cross-wedge rolling	příčné klínové válcování	recessing	osazování
cutter	stříhadlo	roll out	vyválcovat
cutting	stříhání	rotational forging	rotační kování
disturbance	porušení	semi-product	polotovar
drop	pokles	shears	nůžky
drop die forging	kování v zápustkách	solidification	zpevnění
ductility	tažnost	sprinkled	posypaný
ejector	vyhazovač	stroke	úder
flash	výronek	surroundings	okolí
flat	plošný	table shears	tabulové nůžky
forge	kovat	trim	ostříhávat
forge chisel	kovářský sekáč	trimming die	střížník
forge tongs	kovářské kleště	trimming punch	střížnice
forged through	prokovaný	trimming tool	ostřihovadlo
forging	kování, výkovek	uneven	nerovný
forming	tváření	vibrating shears	kmitací nůžky
hammer forging	kování volné	volume	objemový

COMPREHENSION QUESTIONS

1. What do you know about forging?
2. What special methods of hot forming do you remember from the text?
3. What is the difference between flat and volume forming?

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EXERCISES

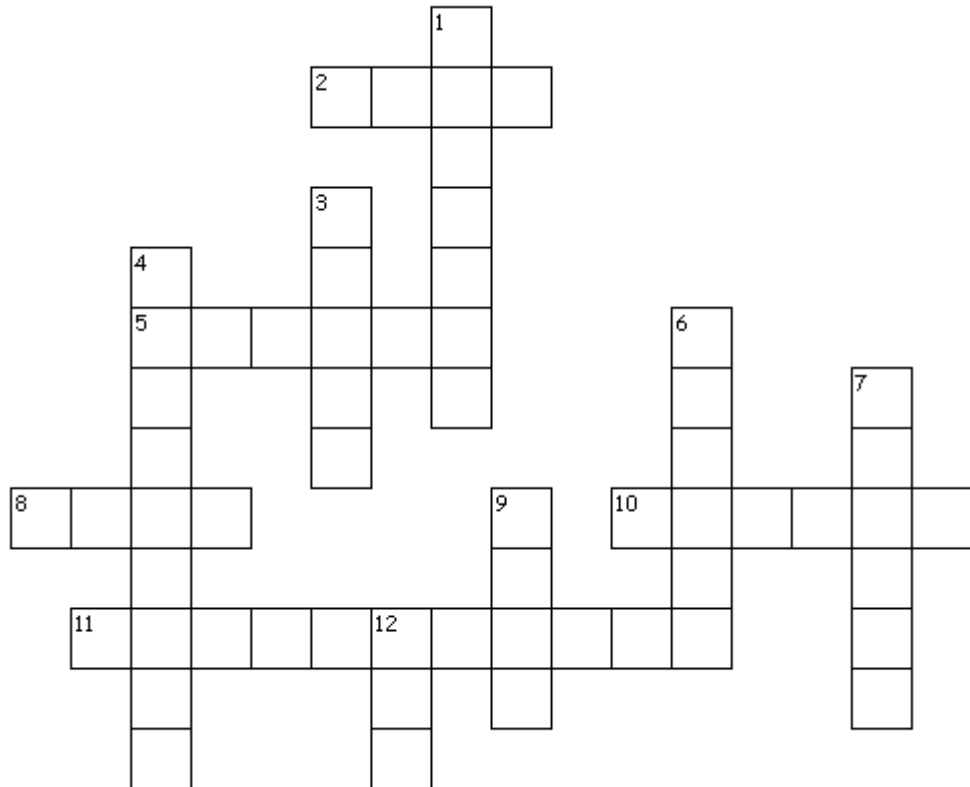
1. Criss Cross Puzzle - 12 words were placed into the puzzle.

Across

- 2. pokles
- 5. nerovný
- 8. ostříhávat
- 10. stříhadlo
- 11. porušení

Down

- 1. kování
- 3. kováadlo
- 4. tažnost
- 6. objem, objemový
- 7. nůžky
- 9. plošný
- 12. beran



2. Match A with B. Then translate the expressions into Czech:

A	B
1 semi-	a die
2 hot	b shears
3 forge	c product
4 trimming	d surface
5 cross	e products
6 rolled	f hammer
7 table	g chisel
8 pressing	h section
9 power	i technology
10 uneven	j extrusion

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EXERCISES – KEY FOR TEACHERS

1. Criss Cross Puzzle

Across

- 2. drop
- 5. uneven
- 8. trim
- 10. cutter
- 11. disturbance

Down

- 1. forging
- 3. anvil
- 4. ductility
- 6. volume
- 7. shears
- 9. flat
- 12. ram

2. Match A with B:

A	B	
1 semi-	e products	<i>polotovary</i>
2 hot	j forming	<i>tváření za tepla</i>
3 forge	g chisel	<i>kovářský sekáč</i>
4 trimming	a die	<i>střížník</i>
5 cross	h section	<i>průřez</i>
6 rolled	c product	<i>vývalek</i>
7 table	b shears	<i>tabulové nůžky</i>
8 pressing	i technology	<i>lisovací technika</i>
9 power	f hammer	<i>buchar</i>
10 uneven	d surface	<i>nerovný povrch</i>

3. Hidden message – *HOT FORMING/tváření za tepla*