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MODULE D
Autogenous welding

Autogenous welding

Autogenous welding

- In technical practice constantly applied welding flame.
- Advantage This welding is its mobility and the fact that there is no need for a power source.
- It uses especially for welding, but also may be flame soldering, cutting, heating, cleaning material.
- Also it is possible to carry out thermal spraying.

autogenous welding

- Another advantage is the possibility of autogenous welding components that have a large space (very good bridging the gap).
- Can set up different kinds of flames, according to the selected welding technology.
- Very good use of welding for assembly.
- Welding is used combustible gases and gases supporting combustion.
- The highest temperature in oxy-acetylenového flame, and it is 3162 C.

Flammable gases

AMBROŽ, O. A KOL. *Technologie svařování a zařízení: učební texty pro kurzy svářečských inženýrů a technologů*. Ostrava: ZEROSS, 2001. s. 27

gas properties	Acetylene	Hydrogen	propane	Methyl-acetylene-propadiene containing Mapp tetrene, APACHE C_3H_4	Of ethylene (ethene)	propylene	terrestrial gas (methane)
Chem. formula	C_2H_2	H_2	C_3H_8		C_2H_4	C_3H_6	CH_4
method of storage	dissolved in acetone	compressed	liquid	liquid	compressed (liquid)	condensed	compressed
Calorific value ($MJ.nf^3$)	56.5	10.8	93.2	82.2	53.9	87.6	35.9
bounds Explosion-air (%)	2.2 to 85.0	4.0 to 74.5	2.2 to 95.5	1.7 to 12.0	3.1 to 32.0	2.0 to 10.5	5.0 to 15.0
Density (kgm^{-3})	1.09	0.08	1.88	1.75	1.18	1.78	0.67
Flame temperature (° C)	3162	2834	2810	2984	2902	2872	2770
Oxygen consumption - 0_2/gas	1.1	0.4	4.0	2.3	2.0	3.1	1.8
Heat of $MJ.kg^{-1}$	+8.7	0.0	-2.4	+4.6	+1.9	+0.5	-4.7

Acetylene C_2H_2

- For welding acetylene is of utmost importance for its very good properties.
- Yippee in engineering practice the most widely used gas.
- Manufactures of calcium carbide which reacts with water.
- Acetylene is stored in the welding pressure cylinders which are filled with porous material.
- This porous matrix contains acetone, which acts as a solvent.
- Acetylene released the collection of bottles of this

Oxygen O_2

- Oxygen is a gas that supports burning itself is not flammable.
- The temperature of the liquid at atmospheric pressure, the air is about 200 ° C.
- Liquid air is fed to a rectification column where the differing boiling gases (nitrogen -196 ° C -185 ° C, argon and oxygen, -183 ° C), leads to their separation.
- Gases are stored in cryogenic tanks in liquid form and distribution takes place in the cylinders as a gas or through cryogenic vessel as a liquid.

types of flames

- Oxy-acetylene flame
- Neutral flame
- Flame with an excess of acetylene (acetylene excess of 5% to 15%)
- Flame with an excess of oxygen (oxygen excess of 5% to 20%)

Oxy-acetylene flame

- Oxy-acetylene flame
- In neutral flame a welding flame sharply bounded and September, dazzlingly white.
- Flame cutting of the ratio oxygen / acetylene:
  - NeutralRatio O_2:C_2H_2 = 1 to 1.1: 1
  - ReductionRatio O_2:C_2O_2 <1
  - OxidativeRatio O_2:C_2O_2 = 1.2: 1.

Neutral flame

- In practice it is used for welding of steels, nickel alloys, copper and also for the heating flame during cutting.

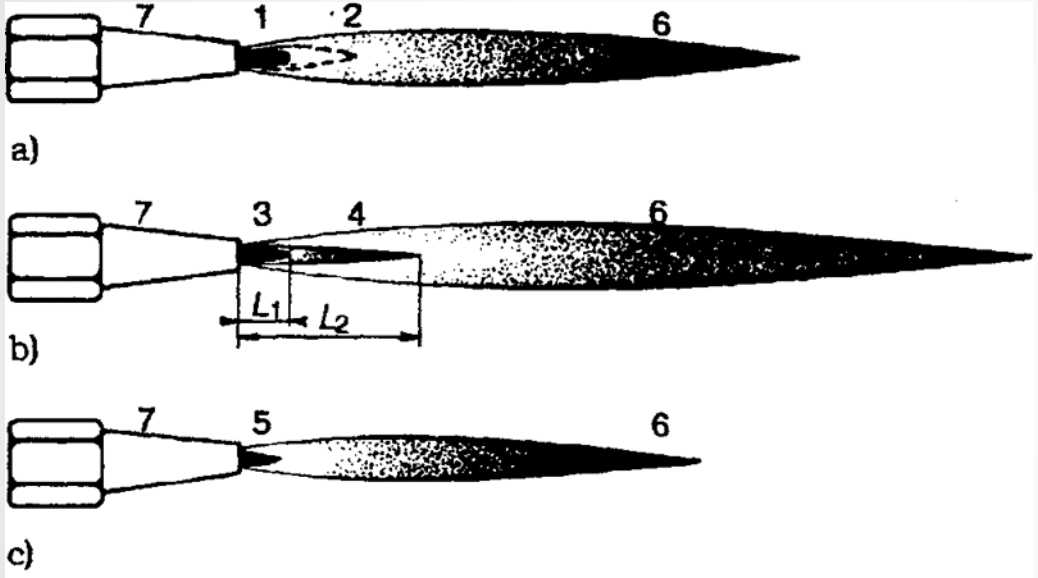
Acetylene flame with excess (excess acetylene 5% to 15%)

- It is used for welding of aluminum, magnesium and their alloys because of the high oxygen affinity.
- Further for surfacing carbide and cementation flame.
- Surplus acetylene in the flame can also be determined by illuminating cones lengths L1 and L2.

Flame with excess oxygen (oxygen excess of 5% to 20%)

- Use – welding brass and bronzes.

Distribution flame oxy-acetylene according to the proportion of oxygen and acetylene



Legend for picture:
a) neutral
b) reducing (excess acetylene s)
c) oxidation (excess oxygen)

1 - welding cone sharply demarcated, dazzling white,
2 - the reducing zone of the flame,
3 - welding flame dazzling white, covered with a whitish veil,
4 - whitish veil
5 - welding oxidizing flame short, blue-violet,
6 - an outer oxidizing flame,
7 - welding nozzle

AMBROŽ, O. A KOL. *Technologie svařování a zařízení: učební texty pro kurzy svářečských inženýrů a technologů*. Ostrava: ZEROSS, 2001. s. 29.

Distribution of the flames by the output speed

KUBÍČEK, J. DANĚK, L. KANDUS, B. *Technologie svařování a zařízení.* Učební texty pro kurzy svařovacích inženýrů a technologů. Plzeň: ŠKODA WELDING, s. r. o., 2011. s. 13.

- Soft
  - The exit velocity of 70 m / s - 100 m / s, unstable and susceptible to flashback arrestors small vortex molten bath is used at least - only for the cladding where the desired flatness of the weld.
- Medium
  - The exit velocity of 100 m / s - 120 m / s, stable, adequate dynamic effect ensures good weld quality and sufficient power.
  - For welding of steel and other metals.
- Keen
  - The output speed is greater than 120 m / s, has a great dynamic effect on the weld pool, dissolves more gas in the weld pool, and increases the thermal influence.
  - Higher welding performance at the expense of the quality of the weld.

Welding technology

- The first prerequisite before starting the welding is to have welding equipment perfectly fine.
- At autogenous welding equipment has a range of sites and articles that can be the source of defects, disorders and accidents.

Ignition flame

- When the ignition flame first carefully opened simultaneously oxygen and acetylene, and ignite the gas mixture formed.
- Settings Flame lit in terms of its intensity must be adjusted so that the flame is still burning and turning off.
- Significant adjusting the flame in terms of the excess of one gas (flame neutral).
- Flame Neutral is the most common use.
- Advantage oxy-acetylene flame is its easy adjustability by color bands flame.
- this Advantages and benefits we provide any other flame.

Too many flame

- When flame extinguishment is first closed on the handle of the welding torch valve combustible gas, followed by closing the oxygen valve.
- After flame extinction is necessary to ensure the flame has gone out again by opening the acetylene valve.

Migration

- Stitching is a connection of welded parts of short welds so prepared weld can be subsequently welded.
- Migration should be given the same attention as their own and stitch welding must be performed as well as the weld.
- If the weld joint will then remove, the stitches should be performed using the same technology as a follow proper weld joint.
- Short welds are moving on both horses and weld length in the middle.
- Other welds moves at a distance of about 25 to 30 times the thickness of the weld.
- To reduce the deformation of the weld (especially in thin sheet) is chosen during the laying special basting stitches.

Welding technology

- Welds are two basic ways to welding and forward and backward welding.

Reverse backfiring

- This phenomenon is not desirable when flame welding.
- If welder does not respond properly, and this phenomenon may also become very dangerous.
- At popping flame enters the torch and burn there.
- If gets to the injector, the symptoms of this condition, whistling.
- Here welder must immediately initiate action in accordance with standard safety regulations CSM 05 0610th
- Beginning backfire manifests concussion shot.

Reverse backfiring

- Further course of backfire can manifest itself:

a) Flame sometimes třeskne
b) Flame Trask intervals
c) Flame Trask in quick succession
d) Whistling burner

Causes backfire

1. small the exit velocity of the gas mixture, in particular when the speed of combustion is less than 70 ms-1 (soft flame).

   Speed burning of the mixture is greater than the output velocity of the mixture.

   cause may be setting a bad flame injector dirty, dirty hoses, rust from the bottle, malfunction of a pressure reducing valve (eg. the freezing).

Causes backfire

2. Clogged or soiled tip of the torch (welding adapter).

   That reduces the flow cross section of the tip of the deposition of combustion products (carbon black, spatter, or contacting with a molten bath)

Causes backfire

3. Superheated the torch tip (welding adapter), which is heated to a temperature above 350 ° C which is the lowest ignition temperature Oxy-acetylene mixture.

   To overheating occurs where the radiant heat heats substantially no welding torch tip extension (fillet weld, discontinuous weld).

Causes backfire

4. Mechanical Burner fault injector pollution, deformation or functional defect.

All these undesired effects can be avoided by satisfying the following bases

- Cooling torch tip (welding attachments) if overheated frequent immersion in water
- Cleaning torch tip cleaning needles
- Right adjusting the flame
- Implementation test effect of the burner injection
- Control state reducing valve, hose and burner

Other possibilities for the use of autogenous

- Gas welding is one of the classic welding methods characterized by long tradition.
- His dominant role and status still retains in occupations such as heating contractor, plumber, pipe fitter, plumber, mechanic and more.
- Irreplaceable It has a role in the repair and renovation.
- Big autogenous advantage is the possibility of welding thin sheet to a thickness of 4 mm, the drawback is, however, a large stress and deformation of the welded material due to heating.

Questions to ponder

1. Explain flame welding principle.
2. What it is split by flame exit velocity of gas?
3. What flame is split by the ratio of oxygen and acetylene?
4. What flame is most frequent in practice?
5. Where we use flame with excess oxygen?
6. What a the speed of the gas at a neutral flame?
7. What a operating temperature is achieved by using oxy-acetylénového flame?
8. Describe properties of acetylene.
9. What they are characteristic for welding forward?
10. What they are characteristic for welding backwards?

Recommended literature and information sources

- AMBROŽ, O. A KOL. Technologie svařování a zařízení: učební texty pro kurzy svářečských inženýrů a technologů. Ostrava: ZEROSS, 2001, 395 s. Svařování. ISBN 80-85771-81-0.
- KOUKAL, J., SCHWARZ, D., HAJDÍK, J. Materiály a jejich svařitelnost. 1. vyd. Ostrava: VŠB – Technická univerzita Ostrava, 2009, 240 s. ISBN 978-80-248-2025-5.
- KUBÍČEK, J. DANĚK, L. KANDUS, B. Technologie svařování a zařízení. Učební texty pro kurzy svařovacích inženýrů a technologů. Plzeň: ŠKODA WELDING, s. r. o., 2011, 242 s.