EXPRIMENTAL USE OF ELECTROLITIC WATER TREATMENT TECHNOLOGY FOR INDUSTRIAL WASTE WATERS

ЕКСПЕРИМЕНТАЛНО ИЗПОЛЗВАНЕ НА ТЕХНОЛОГИЯ ЗА ЕЛЕКТРОЛИТНD ОБРАБОТКА НА ПРОМИШЛЕНИ ОТПАДНИ ВОДИ

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Abstract: *The article deals with waste water treatment technology based on electrolysis using electrodes of patented design, which will effect the oxidizing-reducing reactions, flotation of organic substances and sedimentation by effects of flocculants of electrode materials, and thereby significant reduction of soluble and insoluble substances in water. The results of experimental use of the technology for untreated water from blast-furnace gas washer are shown and statistically analyzed.*
Keywords: WASTE WATER TREATMENT, ELECTROLYSIS, BLAST-FURNACE GAS WASHER

1. Introduction

Under technical sewage water we understand mainly finished cooling emulsion, water from overspray paint of coating compositions in spray booth, oily water from wash rooms and water from gas washing.
After many years of experience with the electrolytic purification method of industrial waters we can conclude that the electrolysis is suitable for treatment and disposal of technical liquids.

2. Experimental use of electrolytic water treatment technology for blast-furnace gas washer waters

2.1 Technology principle

The technology principle is based on electrolysis using electrodes of patented design, which will effect the oxidizing-reducing reactions, flotation of organic substances and sedimentation by effects of flocculants of electrode materials, and thereby significant reduction of soluble and insoluble substances in water.
The nature of the technical solution is application of fully automatic electrocoagular water cleaning with high flotation and coagulation effect, which is based on the patented principle protected by UPV SR under no. 282 797 of 18.11.2002 as Electrolytic water cleaner with rotating electrodes (ŠEBO, SMOLNICKÝ, 2002) (Fig. 1).

Fig.1 Arrangement and connection of electrodes in the electrolytic water cleaner (Remark: one of alternatives)

2.2 Waste water treatment experiment

The input for experimental water treatment was untreated water from blast-furnace gas washer.

Water was treated electrolytically discontinuously with various duration of treatment at electrodes in combination Al-Fe in the design Fig. 2. Electrodes dimensions were 330 x 330 mm, the distance of their separation 80 mm. Samples were taken after the prescribed period of sedimentation / 10 min. /. The parameters of the experiment are recorded in Table. 1.
Tinny electrodes were placed in a universal holder which allows changing the type of material of electrodes, their distance as well as their connection. Tinny electrodes have dimensions of 330x330 mm and 2 mm and 3mm thick sheet plates. In the experiment were used two types of electrode material namely steel and aluminum sheets. Spacing of the electrodes was 80 mm. *(ŠEBO et al, 2009)*

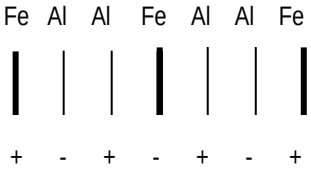

Fig. 2 Arrangement and connection of electrodes method (ŠEBO et al, 2009)

The experimental equipment was connected to sewage water from blast-furnace circuit treatment (fig. 3 and fig 4).

Fig. 3 Connection of experimental equipment for sewage water from blast-furnace circuit treatment (real view)

Flotate and sediment join together at this technology and as the sediment settles in a settling tank and concentrates on the existing part of chemical cleaner. Pretreated water is left to disettle in

segment separator and is cleaned as necessary at the existing filter stream.
Sediment will be disposed by existing system as it is practiced, usually as hazardous waste.

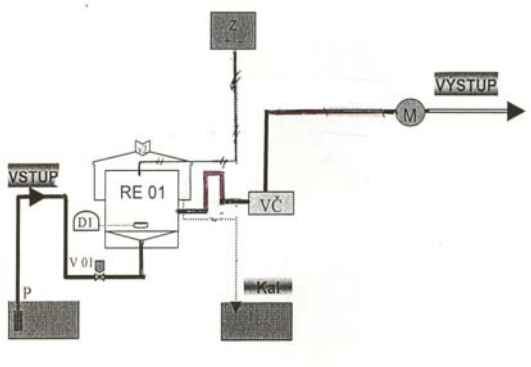

Fig. 4 Connection of experimental equipment for sewage water from blast-furnace circuit treatment (scheme)(ŠEBO et al, 2009)

Legend to Figure 4:
RE - electrocoagular reactor
VČ - force pump
KH - sewage service
D - blowers
Z - source of direct electric current
V - throttle
P - submersible pump
VYSTUP – output
VSTUP – input
Kal - sediment

Conclusion

It is obvious from this experiment that electrolytic technologies are not optimal for treatment of water from washing of dusty blast-furnace gas.

Table 1 Statistical evaluation of experiments

Analysis type	Unit	Input			Output			Efficiency
		Avg.	Var.	Var.%	Avg.	Var.	Var.%	met. %
pH		7,24	0,22	3,07	7,23	0,13	1,82	0,20
Total Cyanide (CN^-)	**mg/l**	0,02	0,01	66,67	0,04	0,03	80,36	-110,00
$N\text{-}NH_4^+$	**mg/l**	95,88	23,70	24,71	92,58	17,02	18,38	3,45
Chlorides (Cl^-)	**mg/l**	3260,17	531,11	16,29	3431,44	321,72	9,38	-5,25
Dissolved substances (DS at 105°C)	**mg/l**	8127,00	1259,67	15,50	8744,82	952,30	10,89	-7,60
Dissolved substances (DS at 550°C)	**mg/l**	6733,00	1082,33	16,08	7258,24	567,70	7,82	-7,80
Not dissolved substances	**mg/l**	651,97	635,16	97,42	77,44	34,13	44,08	88,12
Conductivity	**mS/cm**	11,14	1,91	17,16	11,57	1,07	9,24	-3,85
Fe	**mg/l**	10,13	11,94	117,83	5,97	4,94	82,61	41,03
Pb	**mg/l**	0,45	0,27	59,56	0,29	0,09	30,04	35,62
Zn	**mg/l**	19,88	25,25	127,04	9,24	9,70	105,03	53,53
Ca	**mg/l**	840,00	592,00	70,48	1402,31	850,89	60,68	-66,94
Mg	**mg/l**	160,40	64,48	40,20	331,69	225,37	67,95	-106,79
Sulphates	**mg/l**	383,20	66,88	17,45	431,31	52,90	12,26	-12,55

References:

1. ŠEBO, D., SMOLNICKÝ, P.: Electrolytic sewerage plant with rotating electrodes, patent protected by ÚPV SR č. 282 797/2002,
2. ŠEBO, J. [et al.], Operating experiment of wastewater cleaning around the blast furnace in the USS-Košice 2009. In: MMA 2009: flexible technologies. 10th international scientific conference. Novi Sad, FTS, 2009. p. 270-273- (CD-ROM). ISBN 978-86-7892-223-7