IMPLEMENTATION OF FISHING TECHNOLOGIES AND SUSTAINABLE DEVELOPMENT IN SLAUGHTERHOUSE SYSTEMS

MIROSLAV ĆIRKOVIĆ[1], BRANKICA KARTALOVIĆ [1], JELENA BABIĆ[1], MILOŠ PELIĆ[1], NIKOLINA NOVAKOV[2], SANJA JOVANIĆ [3], VESNA ĐORĐEVIĆ[4]

[1]*Scientific Veterinary Institute Novi Sad, Rumenački put, Novi Sad, Serbia, miroslavcirkovic@yahoo.com*

[2]*University of Novi Sad, Faculty of agriculture, Department of veterinary medicine, Trg D.Obradovića 8, 21000, Novi Sad, Serbia*

[3]*Institute of Chemistry, Technology and Metallurgy, University of Belgrade, Serbia*

[4]*Institute of Meat Hygiene and Technology, Kaćanskog 12, Belgrade, Serbia*

PRIMENA RIBARSKIH TEHNOLOGIJA U ODRŽIVOM RAZVOJU KLANIČNIH SISTEMA

Apstrakt

Primenom ribarskih tehnologija i sistema za prečišćavanje se na bezbedan, proveren i renomiran način uklanja otpad iz klanične industrije vodeći računa o zaštiti životne sredine. Sa otpadom dobijenim iz klanične industrije se postupa na način koji aktivno doprinosi ekonomskim, socijalnim i ekološkim ciljevima održivog razvoja. Sam spoj klanične industrije i ribarskih tehnika predstvalja novinu kako u svetu tako i kod nas (Ćirković, 2014). Upravljanje otpadom je jedan od najsloženijih problema u sistemu upravljanja zaštitom životne sredine. Uzimajući u obzir prirodu sirovina i nastalih proizvoda, otpadne vode koje su nastale u toku proizvodnje i prerade prehrambenih proizvoda imaju po prirodi biorazgradivi karakter. Imajući u vidu da je štednja vode korisna, a prečišćavanje otpadnih voda zakonska obaveza trebalo bi imati na umu da će vode biti sve manje, da će voda biti sve skuplja i da se mora štedeti jer se dva puta plaća - prvi put kada se dovodi u pogon i drugi put kada se kao zagađena mora prečistiti. Činjenica da smo evropska i podunavska zemlja obavezuje nas da se u pogledu zaštite životne sredine ponašamo u istoj meri u kojoj su se obavezale i ostale evropske zemlje. Zahtevi EU podrazumevaju maksimalno smanjenje zagađenja svih vrsta koje se postiže izborom tehnologija koje proizvode manja zagađenja, kao i efikasnijim korišćenjem sistema za tretman produkovanih zagađenja. Prečišćavanje industrijskih otpadnih voda je trenutno apsolutno neophodno. Izlazna otpadna voda iz industrijskih pogona može imati veliki uticaj na kvalitet podzemnih voda i vodenih tokova.

Iz tog razloga povećava se broj institucija i industrijskih kompanija koje odgovorno vode računa o ovom problemu. Sve klanične industrije su obavezne da na bezbedan način izvrše prečišćavanje klanične vode pre puštanja u prirodne recipijente ili kanalizaciju uz obavezno plaćanje nadoknade za ispuštene otpadne vode koja je regulisana zakonom. Primena ove ideje je neophodna jer je ugrožavanje životne sredine jednosmerni problem današnjice, a i problem našeg ulaska u Evropsku zajednicu. Pored toga, nije zanemarljiv ni ekonomski benefit. Naše rešenje uklanja problem otpadnih voda iz klanične industrije, a izgradnjom ribnjaka u sklopu klanice se omogućava proizvodnja ribe u prečišćenoj vodi poreklom iz klanične industrije uz dodatak vode iz bunara. Sam spoj klanične industrije i ribarskih tehnika predstvalja novinu kako u svetu tako i kod nas. Tokom naših ogleda ukazali smo na: održivost klanične industrije korišćenjem ribarskih tehnologija i ekološko rešenje problema otpadnih voda, ribu kao bioindikatora zagađenja životne sredine i kontrole uspešnosti prečišćavanja otpadnih voda klanične industrije; prevođenje dela organskih materija putem prirodne hrane u meso ribe; uravnoteženje i zadovoljavajući kvalitet vode na završetku procesa prečišćavanja, s obzirom da kvalitetna voda danas predstavlja nedostajući resurs; konstantan uvid u zdravstveno stanje riba; proizvodnju ribe kao kvalitetne namirnice sa aspekta mikrobiologije i nutritivne vrednosti ribljeg mesa; korišćenje vode u zalivnom sistemu ribnjaka kao zaokruženog procesa od otpadne vode do vode zadovoljavajućeg kvaliteta za ratarske kulture; sistemi za energetsku održivost: drvenasti ostatak biljnih kultura se loži u energani klanice sa kostima koje su neiskorišćene u mesarskoj industriji čime se postiže veća energetska efikasnost.

Ključne reči: održivi razvoj, ribnjak, otpadna voda, riba kao bioindikator
Keywords: sustainable development, pond, wastewater, fish as bioindicators

INTRODUCTION

Our work provides a compound of the slaughter industry and fishing technologies aimed at improving environmental protection. The application of fishing technology and treatment systems are in a safe, secure, reputable and cost-effective way removes wastewater from the slaughterhouse (Ćirković, 2015a).

So far, the application of the filters system is to thrive after a series of purification methods to obtain the exit of water of appropriate quality, which as such is discharged into drains and sewage system. The fact is that the slaughter industries often do not adhere to the defined capacity, which results in the output of poor quality water. In addition, it should be noted that purified water has no practical value, even when it is of satisfactory quality, when it is discharged into the surrounding channels without exploitation, it is an economic loss (Ćirković, 2015). The aim of our work is to improve the quality of treated water from slaughterhouses and to return to its utility value. The result of our work is to ensure the rational use of water from slaughter houses, with use of fisheries technologies.

MATERIAL AND METHODS

During our research, which was carried out in the meat industry, „Djurdjevic" in Pećinci, the designed system with first pond, ponds with aeration and irrigation canal. Our

work ensured that the use of the aerator and the addition of well water provide suitable environmental conditions for the cultivation of carp fish (Cirkovic, 2015). During our tests, we have provided that the resulting waste water going through the system for a rough separation, which separates the first stage of the physical separation of solid materials by passing through a spiral press the built-in channel. After that, with the help of cells to suppress liquid, water is pumped into the pools. On first pool comes to semi-automatic gravity that rise turbidity particles to the surface of the water carried by gas bubbles, usually air. Raw water is then subject to gross and fine purification - ie equalizing raw sewage comes to the treatment device through a channel with a rough mechanical grates, where larger solid waste is removed. Thus purified water is transferred into the pool for the biological oxidation and nitrification aeration assisted with microbubbles at the bottom of the pool, and the removal of ammonia nitrogen in the middle of the pool with no dissolved oxygen. Finally, we have the final sedimentation static separation of sludge from treated water, return activated sludge in the oxidation stage and equalization, the disposal of excess sludge to the landfill or the required space. A final disinfection of treated water is performed by adding sodium hypochlorite, disinfected water through a pad of silica sand with the help of pumps due to first pond. The surface of the first pond 50x3m is equipped with two aerators that enrich the water with oxygen. Two of the aerator allows reaching of good contact between the water and air that is to reach the intensive transporting gases or volatile substances in the water and out of it. These gases are passed are usually O_2, CO_2, N_2, H_2S, CH_4, NH_3 and numerous identified and unidentified volatile organic compounds that pollute the waste water. Aeration is necessary when wastewater shows a deficit of dissolved oxygen or is loaded with hydrogen sulphide. Water quality is improved with the system of pumps. In addition to water from slaughterhouses fresh well water that is rich in oxygen is added in ponds. The quality of fishery water corresponds to 3rd class water according to the current Regulation and favors the cultivation of carp fish. In 2013 pond is stocked with fry in an amount of 500kg / ha. Suitable physical and chemical conditions of water, which is rich in oxygen and nutrients, have contributed to achieve yields of fish three times higher than the average, 3500kg / ha, during 2013. On the basis of health surveys of fish and meat quality was found that the health of fish was beneficial, while the flesh demonstrated high nutritional value with 4% fat and 18% protein. Excess water from the pond to overflow system is dirrected in irrigation canal whose water quality is 2/3 class water by the current Regulation, which favors the use of the same water for irrigation. Using water from the irrigation system that is warm and that the appropriate quality favors arable crops and affects their yield (Ćirković, 2009). During 2013 an area of 100 ha was irrigated with water from the irrigation system and the yield reached 50 t /ha silage maize. Unused woody parts of corn were used for the production of hot water in power plant.

RESULTS AND DISCUSSSION

During the conducted tests the following results were obtained: the pond water which corresponds to 3rd class according to the Regulation on limit values of pollutants in surface and ground waters and sediments („Official Gazette" no. 50/2012), which is suitable for growing cyprinid fish production was 3500 kg / ha of fish (3 times higher than the average national production according to the Statistical Yearbook), (Ćirković, 2015); complete nutrient consumption amounted to 1.5 kg of feed for 1kg of gain; health status of the fish during

the growing season was favorable (Bogut, 2006). Survival amounted to 95%. The quality of the meat showed a high nutritional value (18% protein and 4% fat).

Water from the irrigation canal which corresponds to class 2nd / 3rd class according to the Regulation on limit values is used to irrigate crops. Irrigation of 100 hectares of land produced corn silage of 50 t / ha. Unused woody part of corn is used in power plants.

CONCLUSIONS

The application of fishing technology enables security during water purification systems in slaughterhouses, because it represents a shock absorber when the technologists do greater than anticipated number of slaughter and undermine the capacity of filters. Our system provides production in all seasons because aeration reduces the amount of organic matter.

Incorporating organic matter from first pond water in fish meat through natural food, we achieved savings in the complete feed mixture and provide a high yield of fish. Water from the canal system of the pond is used optimally for watering the surrounding crops, given its chemical composition and temperature.

Our technology has enabled us to achieve good quality in addition to waste water and achieve good economic sense in the cultivation of fish and agricultural crops.

ACKNOWLEDGEMENTS

The paper is part of the project TR 31011, funded by the Ministry of Science and Technology of the Republic of Serbia.

REFERENCES

Bogut I., Novoselić D., Pavličević J., (2006): Biologija riba I, Poljoprivredni fakultet Osijek

Ćirković M., Đorđević V., Kartalović B., Babić J., Pelić M., Novakov N., Jovanić S. (2015): Rešenje za održivost klanične industrije primenom ribarskih tehnologija. Beograd, Zavod za intelektualnu svojinu.

Ćirković M., Ljubojević D., Novakov N., Đorđević V.(2015): GAJENJE i kvalitet mesa šaranskih riba.Novi Sad, Naučni institut za veterinarstvo.

Miroslav Ćirković, Nikolina Milošević, Mirjana Mišćević, Jovana Vukčević, Zdravko Vašalić (2009):Organska i ekološka proizvodnja na šaranskim ribnjacima, III međunarodno savetovanje o slatkovodnom ribarstvu, Vukovar 16.-17. 04. Zbornik radova, str 25-30.

Uredba o graničnim vrednostima zagađujućih materija u površinskim i podzemnim vodama i sedimentu i rokovima za njihovo dostizanje, Službeni glasnik" br. 50/2012.