PERFORMANCES AND BOUNDS OF THE ENGINEERING WORKS FOR CONSERVING, CLOSING AND ECOLOGICALLY REHABILITATING THE DECANTATION PONDS IN THE MINING INDUSTRY IN THE CARAS-SEVERIN COUNTY

PERFORMANȚELE ŞI LIMITELE LUCRĂRILOR DE CONSERVARE, ÎNCHIDERE ŞI ECOLOGIZARE A IAZURILOR DE DECANTARE PROVENITE DIN INDUSTRIA MINIERĂ IN JUDEȚUL CARAŞ-SEVERIN

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Abstract: *Decantation ponds in the mining industry are high-risk water engineering structures. After ceasing the sedimentation operations, they are subject to a procedure of conservation, closure and ecological rehabilitation and the environmental factors are being monitored throughout the whole procedure. Herewith the situation of decantation ponds in the Caras-Severin County is presented, highlighting the issue of managing and monitoring them after shutdown, legally covered throughout 30 years.*

Rezumat: *Iazurile de decantare provenite din industria miniera, sunt lucrări hidrotehnice cu un grad mare de risc. După încetarea activității de depunere sunt supuse procedurii de conservare, închidere si ecologizare, monitorizându-se factorii de mediu pe toata aceasta perioada. Lucrarea prezintă situația iazurilor din județul Caraş-Severin, ridicând problema administrării si monitorizării post-închidere, legiferata pe o perioada de 30 de ani.*

Key words: *decantation pond, conservation, shutdown, stability, erosion, consequences*
Cuvinte cheie: *iaz de decantare, conservare, închidere, ecologizare, stabilitate, eroziune, consecințe*

INTRODUCTION

Decantation ponds generated by the mining industry are major risk and environment pollution factors based on their sizes, sterile stored amounts, and content of the polluting substances.

The Caras-severin County, that formerly had a powerful ferrous and nonferrous ore extraction and processing sector, today still inherits six decantation ponds, as shown in the table 1.

The purpose of this thesis is to highlight the importance of performing the shutdown and rehabilitation of the decantation ponds of the mining industry, and their significance as a quality structural stability factor.

MATERIALS AND METHODS

The present paper is the output of the field observations, as corroborated with study of each element during the phases of design and execution, taking into account the laws in force.

RESULTS AND DISCUSSION

From the moment of ceasing the sedimentation operations of the ponds, they enter the conservation regime.

It is important for their further evolution to have a conservation period as shortest as possible (during such a period only maintenance activity is performed). Maintaining a pond

requires the permanent readiness of an intervention team fitted with necessary tools and machinery, as well as its monitoring, leading to a significant financial burden for the company involved.

Table 1

Actual condition of the mining ponds in the Caras-Severin County

No.	Denomination of the pond	Pond type	Occupied surface area (Ha)	Stored amount (thousand mc)	Volume (thousand mc)	Commissioning year	Shutdown year	Actual condition
1	Bocsa I	plain	12.64	1.958	0	1963	1994	Closed, rehabilitated without final acceptance
2	Bocsa II	slope	10.57	0.275	1.875	1994	1997	idem
3	Porcu-Ruschita	valley	7.4	0.567	0	1973	1998	idem
4	Ciotorogu-Ruschita	valley	13.0	0.0001786	1.47	1990	1998	Idem
5	Sasca-Montana	slope	8.4	2.097	1.003	1972	1999	Conservation technical project prepared, shutdown bid in progress
6	Tausani-Moldova Noua	valley	151.0	5	3.79	1995	2006	Conservation technical project to be prepared

The decantation pond on the location *Sasca Montana* is declared in conservation state since 1999, but the shutdown and ecological rehabilitation activities have not started to date.

It is a pond with particular stability problems. During its operational period it slid twice (1991, 1992) covering about 2 ha of agricultural fertile land located in the meadow of the Nera river. Considered and designed as a slope pond, it is in fact, based on the land morphology, a valley pond because it is located on a valley with a dried watercourse. As such, based on its construction, a watercourse-undercrossing channel is missing. When precipitations are high, the reverse probes do not behave as expected and the pond slides. The provisional solution - also being currently used - is to make a sentinel channel on the western bank which to overtake the feeder stream. Being a dug channel not embedded in concrete, accentuated vertical erosion occurs. Deep ravine emergence on the edge of the pond is frequent.

As from December 2006, the sedimentation operations in the *Tausani* pond (located near the town Moldova Noua) are stopped, and the mining pond enters the conservation phase. The company Moldomin SA, owner of the pond, does not provide the conservation works anymore due to the lack of funds and workforce, as beginning with April 2007. The consequences might be uncommon and unprecedented, when considering that this artificial mud lake is the biggest in Europe (151 ha) and it is located on the border with Serbia and in the mighty local wind named Cosava which entrains large dust amounts and generates Aeolian ravines.

For ponds in conservation, it is important to prepare technical projects that cover as mandatory security state assessment studies. Such studies, legally justified by the *Emergence Ordinance no. 244/2000 on the security of dams, approved with subsequent alterations and completions by the Law no .466/2001* and the *Technical Norms for water engineering works* ("NTLH") stipulate all the works necessary for setting in security state before starting the ecological rehabilitation works. The shutdown and ecological rehabilitation of the mining

decantation ponds is carried out under the coordination of the company Conversmin SA Bucharest, through its area operators, throughout several years, and over this period, the monitoring of the environmental factors is also performed. Such type of engineering works was performed for the following mining ponds: *Bocsa I*, *Bocsa II*, *Porcu Ruschita*, *and Ciotorogu - Ruschita*. No one has been subject to final acceptance, that means in fact handing over to certain beneficiaries (local municipalities, private persons, etc.). Handing over such ponds implies also, according to the Rom. Govt. Decision no 349/2005, to monitor them post closure over a 30 years period, without specifying the funding source and the administrator of these post closure monitoring operations. What happens with these ponds during this period of lack of specific legislation?

At the pond *Bocsa I*, the sentinel channels that were built with stone riprap became clogged and portions of several meters have been vandalized. At the pond *Porcu - Ruschita*, on the slope of the priming embankment, tail rocks from the marble quarry Ruschita have been laid down and the road vehicles created an access road in the area where the undercrossing channel (with circular cross-section) was extended (with trapezoidal cross-section). This could pose structural trouble.

At the upward mouth of the channel, which undercrosses the Porcului Valley steel rails (girders) have been placed in order to stop, the floating matter, but they are stolen now.

The network of piezometers installed to monitor the hydrostatic level was also pillaged.

The company Conversmin SA, although it has completed the works of shutdown and ecological rehabilitation, is able nor to hand over the engineering undertaking neither to provide its watch.

The pond *Ciotorogu - Ruschita* operated for a short period, before being closed and ecologically rehabilitated. The brook Ciotorogu was diverted through a gallery, thus emerging the risk of its clogging when powerful high floods occur. The sentinel channel is provided with energy breaking steps - it borders a steep slope hence clogging removal operations required - so that rainwater does not enter the pond.

All over the pond surface locust and poplar, trees were planted but they were also vandalized here and there. Even on that place no watch and no maintenance is being provided.

CONCLUSIONS

Even if we accept an ideal matter of facts, that is the closure and the ecological rehabilitation was performed correctly and on time, there are a couple of questions related to their time evolution:

- at the ponds fitted with reverse probes, these might get out of order in time, by either breaking or corrosion. They are worn out especially over the horizontal axis, and this shows on the pond surface as crumbling funnels;
- evacuation of water from the hydrographic network (on the ponds like those found on *Porcu* and *Ciotorogu* locations) through diverting galleries or undercrossing channels, is important for the stability of the ponds and their clogging has to be avoided especially when it comes to large watercourses;
- undercrossing channels are less secure than diverting galleries as concerns the pond stability. The valley dug by the watercourse does not remain at the current stage of the thalweg, and the erosion in progress will degrade the channel making use of fewer energy than the one spent by the same watercourse during the digging of the present-day valley;
- sentinel channels on the slope foots are an important stability factor for the pond but their efficiency might be low if they have significant clogged sections. It is mandatory

that they discharge water into a catching watercourse under the protection of the banks of the latter.
The following pictures support the issues approached above:

Fig.1 - The pond Porcul-Ruschita

Fig.2 - Ravines at the pond Sasca Montana

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