

M. A. ARUSTAMYAN ("NPO "RIVS" JSC)

I. Sh. SATAEV, B. A. KUTLIN ("RIVS"-project" JSC)

THE MAIN REGULATIONS OF DESIGNING ACTIVITY OF "RIVS" SCIENTIFIC AND PRODUCTION CORPORATION IN MINING AND CONCENTRATING PRODUCTION



*M. A. ARUSTAMYAN,
Executive Director,
Candidate
of Technical science*



*I. Sh. SATAEV,
Executive Director,
Candidate
of Technical science*



*B. A. KUTLIN,
General Director,
Doctor
of Technical science*

It is known that success of the any project of the mining and concentrating production is defined by the following principal factors:

- modern reliable technology of treatment of the raw minerals;
- correct calculation and choice of the main technological equipment and arrangement of the last one;
- availability of experienced and qualified executers.

In the past there were clear projecting specializations in the former USSR:

- scientific researches were carried out by NII (Scientific-Research Institutes), the last ones gave out the initial data for projecting, technological regulations;
- solely project works;
- construction works carried out by the organizations in accordance with the own plans, not coordinated always with one or another task of the project of the concentrating production.

The most crucial and complicated projects were carried out by the complex institutes involved in three structures. The general coordination of the project works were fulfilled by the Chief Directorates of the Ministries and by the plants-customers. For all this any project institute, with the exception of the complex ones, has not contributed its overall share to the work. So, the institute was not responsible completely for consequences of realization of the project on the whole.

The worked up and realized projects of the concentrating factories in Zhezkazgan, Almalyk, Talnakh, Kryvbass, Erdenet and so on were the classical soviet projects in the field of mining and concentrating production in the former USSR. The projects were worked up by the complex institutes Mekhanobr, Mekhanobrchermet, Sibtsvetmet and others.

Above mentioned projects were the basis for forming of the gener-

ally adopted later standards of technological projection, methods of estimation of efficiency and others requests and working conditions.

Today the complex research and project organizations almost stop their activity. The organization branch structure for working out and realization of the projects has disappeared.

In accordance with the world practice the functions of general contractors of the works as a whole are given to the engineering organizations. They carry out the complete set of the works beginning from conception of the project, supply with equipment, construction up to the total completion of the project.

NPO "RIVS" combines the traditional and the modern experience of its own research, design subdivisions and machine-building facility. It ensures the key participation in realization of the pro-

jects. And what is more, concord of knowledge and possibilities of the company permits to build the produced machine into technological schemes and to fulfill additional optimization of the new technologies by means of creating of the most effective constructions of the new machines, combination of the last ones and the regimes of the work.

Today the corporation is able to ensure the whole complex of the works for creating of the new and for renovation of existing facilities: beginning from selection of the most effective technology to the final transfer of the object to the customer with attainment of guaranteed technological parameters.

Till recently the projection stage has been absent in the chain of NPO "RIVS". The project works have been carried out by contractor organizations in accordance with the technical tasks worked up by NPO "RIVS". In this case the contractor has been inevitably given in ownership the technology, "know-how" and specific parameters of equipment and the means of automation. But responsibility to the customer remained on initiator of the project.

In 2005 it has been set up the own branch subdivision — "RIVS"-project" JSC.

From the very beginning it has been established priorities of fulfillment of the works of the corporation:

1. Carrying out of the own scientific-research works with the real ore samples and giving out of technological regulations for projection. At this stage it has been established the technological parameters: optimum output of the products of concentration and content of the one or another components in the products; specific load on the equipment, conditions of comminuting for effective opening of the minerals and others; choice of the machines for all operations.

Sequence and depth of studying of some stages of the project ensuring maintenance of achieved level of production or its increase; the terms of fulfillment of the every stage are coordinated with the terms of delivery and mounting of the equipment.

2. In the most cases it is carried out detailed technological audit of the current state of the concentrating factories. As a rule, for this it is recommended to renew the ore preparing facility for decrease of coarseness of the crushed ore by means of replacement of the crushers, screens, classifying equipment, development of automated control systems for technological processes (ACSTP). That the offered measures are accompanied by decrease of the capital investments, operating costs

(first of all electric power and comminuting bolls) and are compensated in 12–15 months.

In the course of reconstruction of the crushing facilities it is selected, as a rule, modernized conical crushers produced by Uralmashzavod. The crushers allow to carry out the optimum conjunction of the crushers at the three stages of crushing and to install as far as possible the new high effective screens manufactured by RIF or others Russian producers. As a rule, analysis of the versions shows some pricing advantages of equipment produced by the Russian firms. They ensure decrease of coarseness of the crushed ore from 22–25 to 14–15 mm in the open and to 12 mm — in the closed crushing cycles.

3. At the same time according to order of the customer and in accordance with the technical parameters, suitable for conditions of the project, it is offered equipment, means of automation, power supply correspondingly to the technical solutions of the corporation. The last one works in cooperation with the known firms: Outokumpu, Metso Minerals, Cetco, Diemme and others.

In processing of the ores with high content of the mud and moisture (GOKs of the Republic Bashkortostan and Kazakhstan) the semi-self-comminuting crushers of the ore are the priority equipment. Besides, it is recommended the technologies of the classical ore preparing with separation of the fine fractions by screening or washing of the ore and separating of flotation treatment of the fine fractions (mud) in the independent cycle (fig. 1).

Two projects with technology of semi-self-comminuting are realized partially today. It is completed projecting and expansion of Kajaransky concentrating factory with increase of its yearly productivity from 8.5 to 12.5 million tons of the ore. It is foreseen installation of the mill 10.34 meters diameter of the firm "Fuller" (the USA). The peculiarity of the project is the version of directing of the "critical" class of coarseness directly to the ball mill of the second stage of comminuting with exclusion of the operation of additional crushing.

It is carried out the working projecting and it has been begun construction of Khaibullinsky concentrating factory with annual productivity 3 million tons of the ore at the deposit Yubileynoye in Bashkiria.

Projecting of flotation facilities uses in maximum degree the factors marked by technological regulations, contrast range of properties of the valuable minerals revealed in the course of oxidation and thermal

treatment of the pulp. Thus, separation of the copper-“head”, oxidizing steaming and heat conditioning of the pulp in the lime medium are used in the cycle of the zinc flotation in the course of concentrating of the copper-zinc-pyrites ores (fig. 2).

The rubbing complex for mechanized renovation of the surface of the fine-comminuted minerals before flotation operations is the latest work of the corporation. It is very important in technology of the pulp conditioning. The prototype of the complex was used at Uchalinsky GOK. It permitted to increase content of zinc in the zinc concentrate from 46 to 50% with the same level of extraction.

Today it is projected the comminuting complex. It will permit to involve in treatment every year 4 million tons of the out-of-balance dumping ores at Almalyksky GMK with hydraulic transportation of the ore pulp to the distance 6.5 kilometers to the copper concentrating factory.

It is carried out now the project of treatment of the out of balance raw minerals of Kal'makyrsky mine.

The project may be the prototype of the module solution for many mining and concentrating works accumulated sizeable volumes of the out of balance and poor ores. On addition of flotation facility the project is utterly completed with the standard Russian equipment and may be realized in the shortest time.

It has been worked up the project and begun reconstruction of the fluor-spar concentrating factory “Borundur” in Mongolia.

Successful development of the project of the second turn of concentrating factory “Erdenet” in Mongolia is the pride of NPO “RIVS”. The new flotation technology has been worked up and put into practice in 2006–2007. The technology has ensured double increase of extraction of molybdenum. It has been worked up the project-estimate documentation, organized making and delivery of the metallic constructions and equipment (flotation machines RIF 25 and RIF 16, contact vats RIF 100 and others). Some share of the body articles of flotation machines RIF 16 and contact vans, non-standard equipment were made at

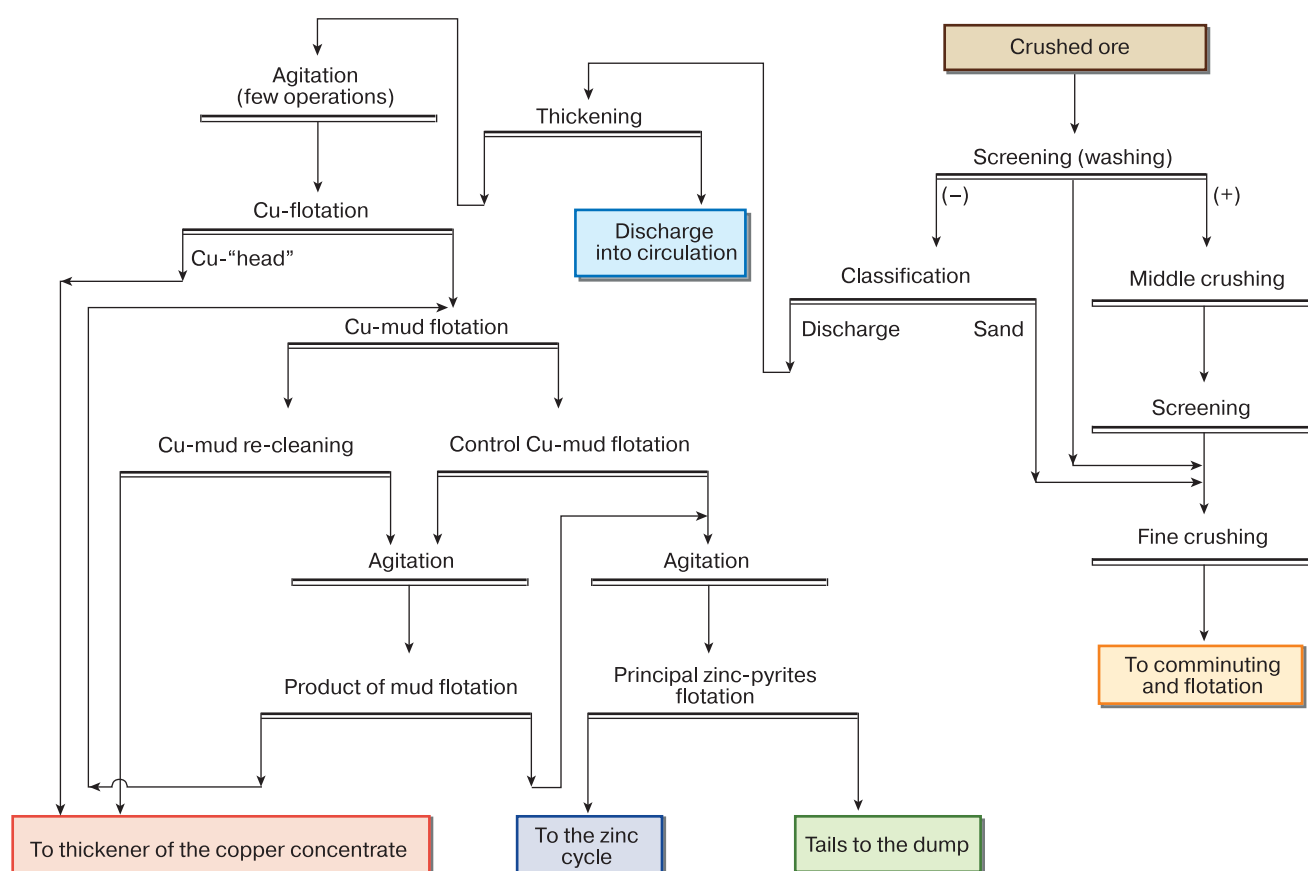


Fig. 1. Example of technological scheme of concentration of the copper-zinc ore with separating of the mud flotation in the independent cycle

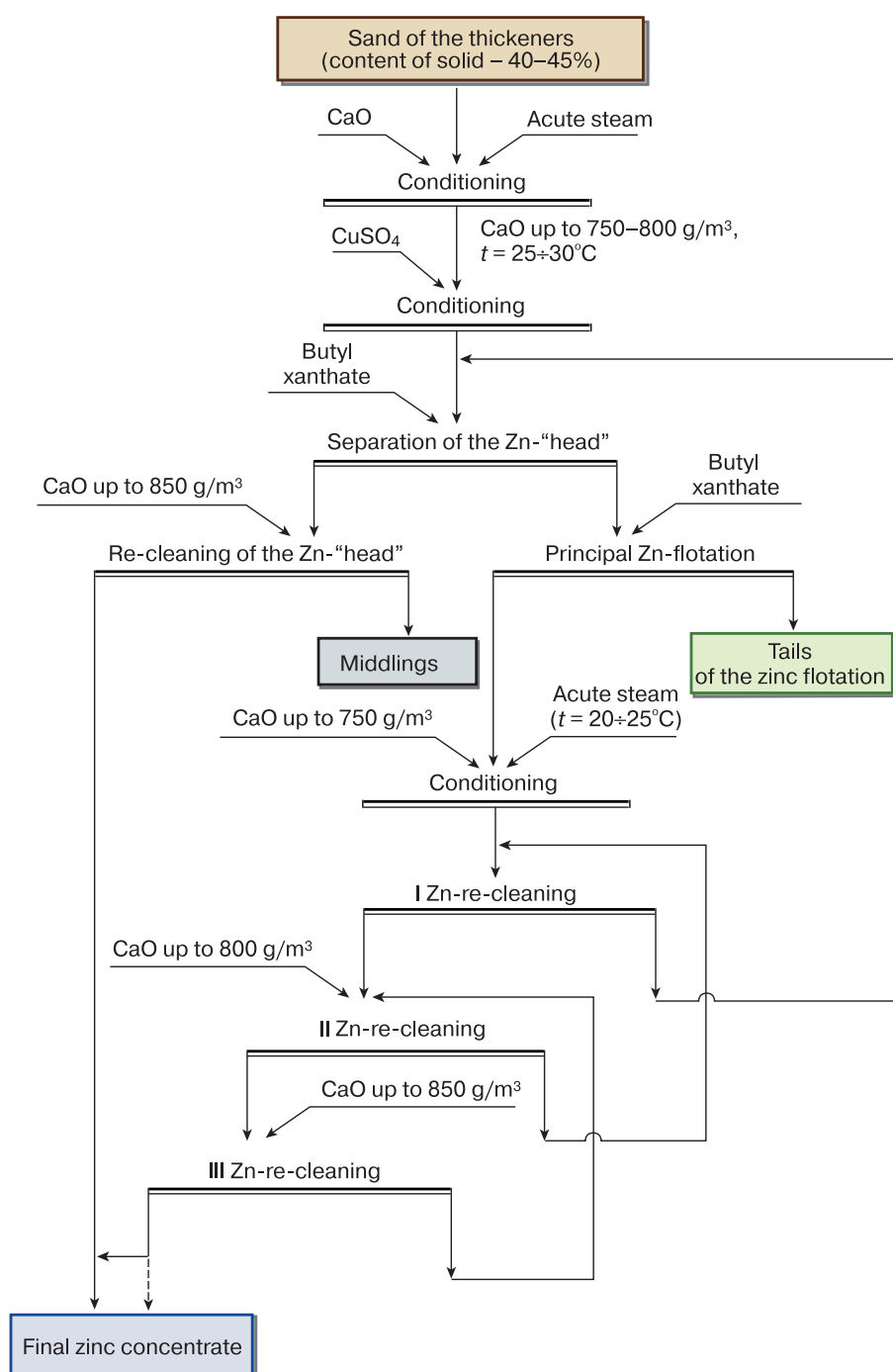


Fig. 2. Technological scheme of the zinc flotation cycle of Cu-Zn ore with operations of conditioning of the pulp in the contact vats RIF

the local repair-mechanical plant. Construction-assembling works, technological adjusting of the process and putting into operation were carried out in the shortest time. The project annual capacity of the new facility has been increased from 4 to 6 million tons.

It has been built and put into operation the third flotation section of Sybaisky concentrating factory

(Bashkiria) (fig. 3). The section was constructed in 2008 in accordance with projection solutions of NPO "RIVS". Its productivity is 1.5 million tons of the ore.

The technologists of the corporation use actively in all works flotation reactants of the firms "Saitec" (the USA) and "Clariant" (Germany). The reactants are the basis for preparing of technological regulations for



Fig. 3. Flotation section № 3 of Sybaisky concentrating factory

projecting of additional flotation of the ferro-containing concentrates in Kryvbass. Besides, it is projected flotation facility with productivity 4 million tons of the concentrate for “Karel’sky okatysh” JSC.

The long-term experience of NPO “RIVS” demonstrates convincingly efficiency of usage in the projects of the flotation machines RIF. One of the advantages is the possibility to choose the type, dimension and working regime taking into account technological features of the raw ore and the purpose of the operations. It is marked that equipping of flotation facilities with flotation machines of the type RIF or modernization of the operating machines by means of placing of the aerators RIF into flotation chambers have improved significantly technological parameters at the concentrating factories of the combines “Pechenga-nickel” (OK-40), “Erdenet” (FPM-12.5), Uchalinsky GOK (FPR-40) and others. Power inputs have been decreased significantly. So, the flotation machines and units of the last ones may be used independently in the further projects.

Experience of work of NPO “RIVS” shows that application of automated pneumatic-mechanical flotation machines for re-cleaning has the number of advantages in comparison with intensively propagated lately pneumatic (columnar) machines.

More and more attention is paid by the corporation in its projects to application of the new equipment in the cycles of additional comminuting and processing

of the products of flotation. They are the ball mills Vertimill, automated hydrocyclone units with the complete automation. The equipment is involved in the working out projects of Khaibullinsky, Kajaransky and others concentrating factories.

It is preferred installation of the press filters in accordance with the project of the filtering facilities of copper, zinc and molybdenum concentrates. Experience of operation of Uchalinsky GOK and GOK “Erdenet” demonstrates convincingly possibility of the total exclusion of drying of the concentrates or significant decrease of expenditures for this operation.

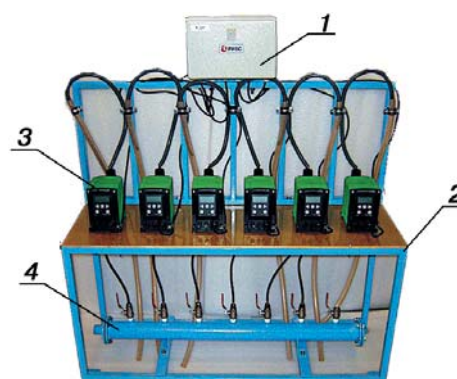


Fig. 4. Dosing table for flotation reactants UDFR

1 — terminal box; 2 — frame of the table; 3 — dosing pump;
4 — collector

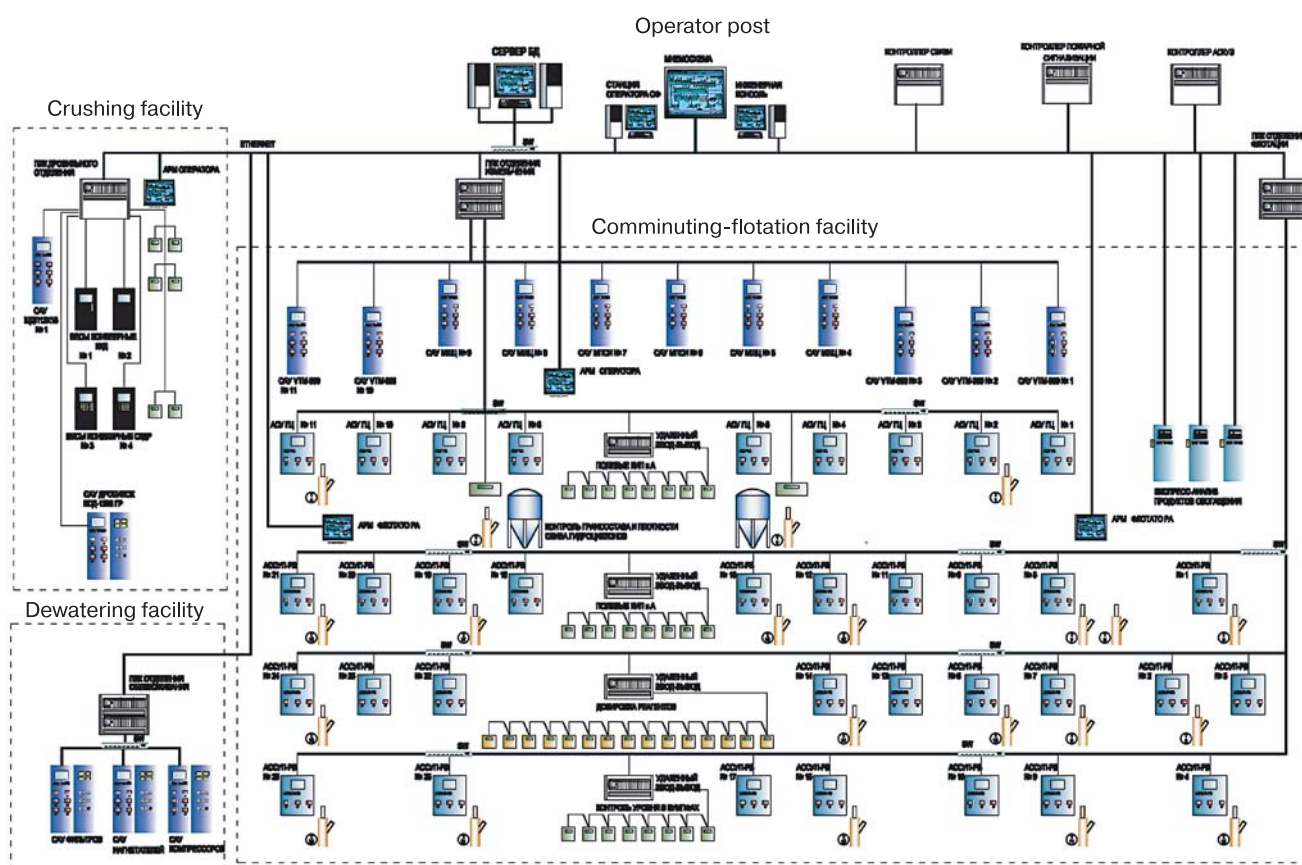


Fig. 5. Structure of the complex of the technical means of ACSTP of Khaibullinsky CP

Technical solutions for ASAK and ACSTP of the concentrating facilities, used in the projects of “RIVS-project”, are directed to application of the immersible systems of the operational analytical control “Amdel” (Austria), PERT (the USA). Dosing of flotation reagents is carried out on the base of the worked up and produced by corporation units UDFR (fig. 4).

Every principal technological apparatus (ore mills, flotation machines, hydro-cyclone units, press filters), used in the projects of the corporation, are equipped with the devices of control of regulated parameters. The last ones form the initial base for automated control and adjusting from the control panel of the operator. Besides, they are the basis for building of the expert systems (fig. 5).

Thus, synchronous combination of technological tests, working out of the equipment and selection of the optimum parameters of the used equipment of the firm are the guarantee of high level of the projects of NPO “RIVS”.

“RIVS-project” JSC, as a part of NPO “RIVS”, is the organization that is able to working up the projects for the whole complex of the works at the mining and concentrating facilities. The basis factors are:

- ♦ availability of the own base for fulfillment of the regulating works, facilities for making of the equipment, possibilities of its mounting and putting into practice, guarantees of achieving of the project parameters;
- ♦ close creative cooperation with the organizations, projecting operation of the mining complex. **EM**