

Career episode – civil

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Career Episode 3 a) Introduction This career episode describes my working activity from September till October 2xxx. I was working as a group leader at the design of water-supply and sewerage works and networks of the FFF Bauxite Mine and of a town situated in Komi Autonomous Republic. b) Background. After reviewing the background data I had to define water-supply sources, to calculate water consumption for domestic, industrial and fire safety purposes of the mine industrial area and the town. I also had to estimate sewage runoff and to select appropriate water and sewerage works. I had to foresee the measures devoted to environmental protection. As usual I closely collaborated with relative specialists- prospecting specialists, electrical engineers, water engineers and metallurgical specialists. For this design I carried out all the necessary calculations, developed the principal main water-supply and sewerage works schemes, water consumption and water removal balance schemes. All the calculations were carried out on a computer. While I was working on the project I took part in the negotiations with the customer, where we discussed the engineering and environmental protection problems.

After completing my work I gave the explanatory note to my customer for approval. c) Personal workplace activity. For this design I studied a lot of materials which contained the information about hydrological, geological and climatic parameters of the designed industrial site area. I analysed accounts of preliminary and detailed groundwater prospecting for household water-supply. The careful study of this information made it possible for me to offer the disposition of water-intake works (artesian wells) not at the place recommended at the preliminary prospecting. That fact excluded the

possibility of chemical and bacterial contamination of the water supply source. I carried out the calculations of water consumption for domestic, industrial and fire safety needs. On the basis of these calculations I developed the water-supply scheme. This scheme was as follows: Water from the water-intake wells is distributed by the pumps to the regulating reservoirs intended for the water collecting before the pumping station of the second raising.

The pumps at the pumping station of the second raising discharge water from the regulating reservoirs to the reservoirs where fire-proof, emergency and controlling reserve of water is kept. From the reservoirs the water flows under gravity to the circular network. I made provision for a special installation of the regulating valves with the electric drive in the wells near the tanks in order to pass the fire safety reserve of water. In this project I made an important decision regarding environmental protection. I offered to disinfect potable water at the bactericidal plants.

Besides, I foresaw the reserved disinfection of water with the solution of sodium hypochlorite obtained from the solution of salt in the electrolyses. For this design we (my group under my direction) worked out the borders of sanitary protection zones for water-supply sources and water storage tanks. We kept in view the further development of our object. We also included all the sanitary steps around the zone territory according to the construction standards and rules. On the industrial areas of the mine I designed the recycling water supply systems for a diesel power station, for a crushed stone factory and for a car-washer.

I estimated and selected the following works and networks of the recycling water supply systems: recycling water-supply pumping stations, water-cooling towers, car-washer sewage water treatment plants, recycling water pipe-lines. These recycling water supply systems allowed to reduce fresh water consumption. The recycling water supply systems make 92 percent of the whole mine water-supply in this design. I also calculated the following sewerage systems: household, industrially-storm and industrial ones. For the household sewerage system I estimated and selected sewerage pumping stations, domestic sewage treatment plants, sewerage networks.

At the disposal works waste water passes step by step the intake chamber, the racks, the grit catchers and then enters the mixing chamber. The aluminium sulphate solution and chlorine water are fed there to improve oxidising of ammonia nitrogen. Then sewage enters the sedimentation tank, where settling takes place to separate the main part of pollutants. In order to remove residual organic pollutants and unsettled suspended matter the further sewage treatment goes on by the oxidation on the surface of the pores filter bed. Treated sewage water enters the contact chamber for the disinfection.

In my explanatory note I gave the description of all the sewerage works and represented the tables of pollutants concentrations in household sewage before and after the purification. I also represented the results of the suspended matter and biological oxygen demand (BOD) sewage purification degree design taking into account the process of the mixing with water of the river, in which sewage is discharged after purification. Disposal works which I have selected ensure household sewage purification up to the

maximum concentration limits that in turn permit to discharge sewage into basins important for fish industry.

I also made provision for storm water treatment. Storm water full of black oil from the territory of lubricating materials storehouse, from a car park and garage, sewage from the repair shops enter the stormwater treatment plants. Here sedimentation and purification take place on the filters. After purification storm water isn't discharged into the basin but it is utilised in the hydraulic ash removal system of the boiler house and partly used to fill the recycling water supply systems of HPP (heating power plant). I also designed the second sewage utilisation for the industrial sewerage system.

Sewage from the hydro-washing of the floors of crushed stone factory and of grinding-sorting factory enters the pumping station and then the sewage flows to the ash dump of HPP to fill the recycling water supply systems. In this project I had to solve the problem of the FFF bauxite mine quarry water treatment working together with the water engineer and the specialist of our institute scientific research department. I provided for the sewage treatment and the sewage discharge into the river belonging to the fish-industry basins of the extra quality, where the pollutants content was carefully controlled by the present legislation.

The mine quarry water is a mixture of treated industrial water and water pumped from the mine underground roadways. The water is generally polluted by the suspended matter and the oil products. First the quarry water flows into the sedimentation tank. In the sedimentation tank the averaging of seasonal movements of water consumption and the partial suspended matter sedimentation takes place. To achieve the required purification

degree I developed the process flow sheet with the reagent water treatment and the following filtration. The flow sheet includes:

The suspended matter treatment in the sedimentation tank with sodium aluminate as a coagulant. Filtration. The pollutants content after the purification meets the specifications of the maximum permissible concentrations of the controlled components for fishing basins. To achieve the required purification degree I provided for the centralised control of the process, the automatic adjustment of the parameters and the analytic control of the quality of influents and effluents. To ensure reliable work and optimal sanitary-engineering conditions all the reservoirs equipment is provided by the special devices.

These devices give warning signals if the limiting value is achieved. All the equipment and all the pipe-lines which are exposed to the aggressive medium acting are protected by the special corrosion proof coverage. d) Summary. In this design many tasks and problems were accomplished. They are closely connected with water-supply, water draining, sewage treatment, environmental protection of the designed object. Developing this design, I managed to apply all my knowledge and skills of a construction engineer. The design was approved and co-ordinated by the customer.