

Contributing to Resource Reuse by Recovering High Concentrations of Copper from Wastewater



Copper, a base metal used in many everyday items, had been treated as a resource available in relative abundance in the Earth's crust. Now, however, the mining of copper has become difficult and there are even those who are starting to think of it as a "rare metal."

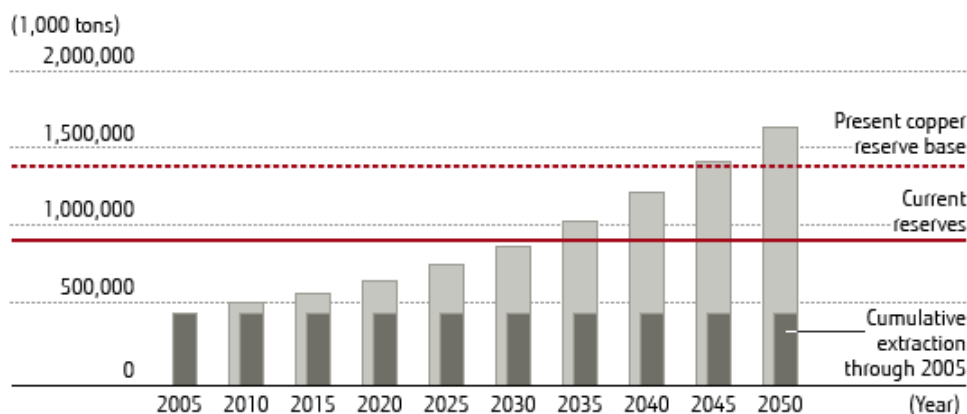
At Fujitsu's Nagano Plant, we have embarked on an initiative in which the recovery of high concentrations of copper from industrial wastewater will lead to the effective reuse of this finite resource.

Current Status of the Familiar Resource, Copper

Copper, which is referred to as a base metal, is used in familiar items like 10-yen coins and electrical wire. Said to be the metal first used by humans, the smelting of copper has been going on in various places across the globe since time immemorial. Mining rich copper ore, however, is no simple task. The limits of what can be retrieved from surface mines have been reached in recent years and underground mines are extending deeper and deeper into the Earth. This kind of mining requires more energy, and produces more waste, so there are concerns about rising environmental impacts^{*1}. Mining can also give rise to surface subsidence and sinkholes, and chemical contamination of soil, groundwater, and surface water, as well as other forms of environmental pollution.

Even as copper becomes harder to find, however, demand for it is rising. It is predicted that by 2050, cumulative consumption of copper will exceed copper ore reserves^{*2}. The recycling of copper, therefore, will become ever more important as a way to effectively use a finite resource without impacting the environment.

Forecast of Global Cumulative Copper Consumption



(Note) The reserve base is the amount of copper ore that is technically feasible to mine, but for which economic or other reasons have precluded mining.

Source: Prepared by Fujitsu based on information referenced from "Forecasting of the Consumption of Metals up to 2050" published by the National Institute of Materials Science.

*1 Environmental impact of copper mining:

 [Please refer to the Annual Report on the Environment in FY 2011](#) [1.37MB]

*2 Copper consumption forecasts through 2050:

[Please refer to "Forecasting of the Consumption of Metals up to 2050." published by the National Institute of Materials Science](#) 

Issues in the Recovery of Copper from Wastewater

Copper is used in the Fujitsu Group's ICT equipment. One example is the printed circuit boards used in servers and other equipment. Printed circuit boards consist of plastic onto which copper sheets have been laminated and etched to create circuits connecting electronic components. Fujitsu's Nagano Plant manufactures printed circuit boards.

Wastewater containing copper results from the manufacturing process for printed circuit boards, so the Nagano Plant is pursuing initiatives aimed at recovering high concentrations of copper from the wastewater. In the past, multiple chemicals were used to coagulatively precipitate copper out of wastewater. Those chemicals, however, bonded to copper in large volumes, creating a sludge^{*3} from which it was difficult to recover high concentrations of copper. Moreover, the recovery process required significant amounts of time and additional space for the installation of processing facilities.



Printed circuit board



Sludge



Conventional facility

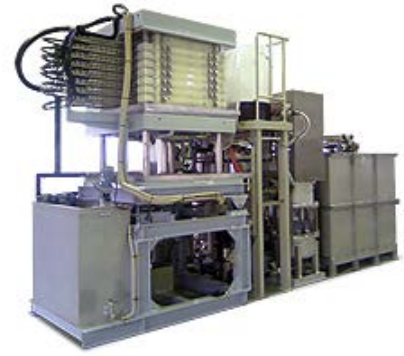
^{*3} Sludge:

A semi-solid substance that is generated from the processing of wastewater and contains heavy metals, water, and other substances.

Enabling the Recovery of High Concentrations of Copper by Revising the Wastewater Treatment Process

To improve the recovery of copper from wastewater, members of a new-technology advancement project organized by Fujitsu Facilities Limited, the manager of the Nagano Plant's facilities, began to consider wastewater treatment approaches that did not use chemicals in a coagulative precipitation process. What they settled on was a new system that recovers copper from wastewater with a filtration process.

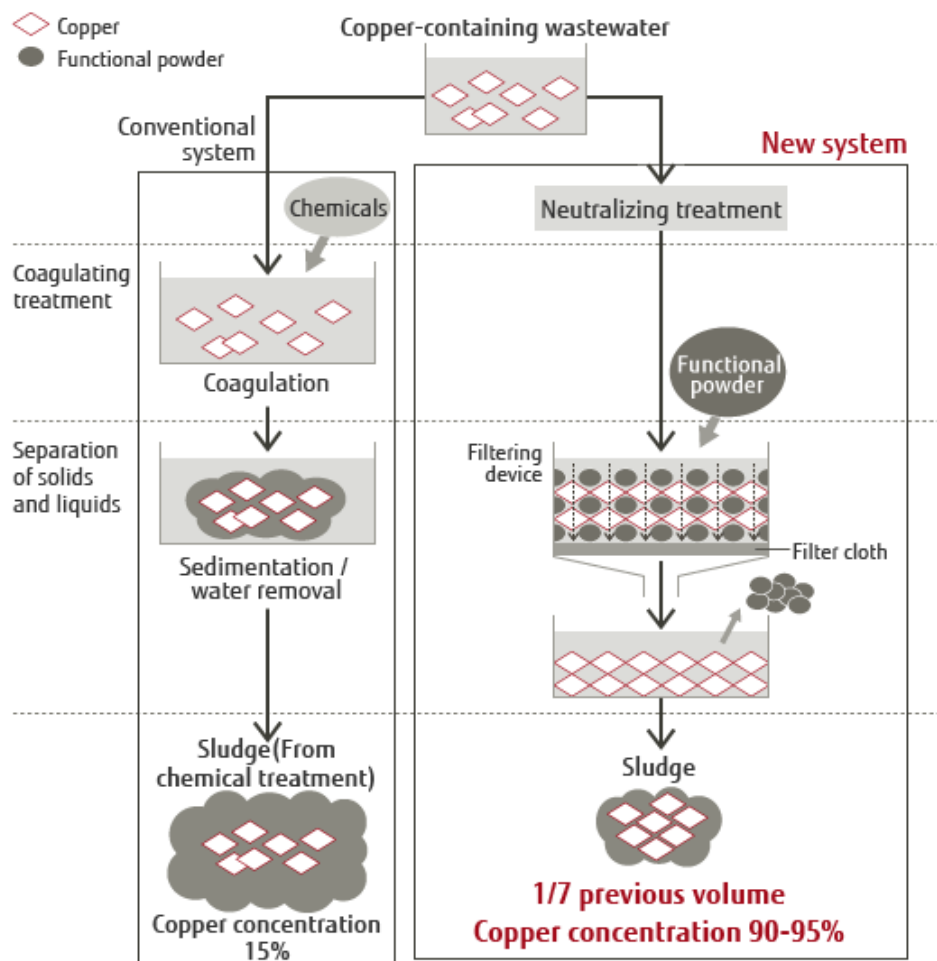
Copper particles are extremely small and clog filter cloth, so filtering was previously not a practical option. The new system, however, uses a functional powder that provides high filtering efficiency, so the separation of solids and liquids can be performed without clogging the filter cloth. Furthermore, after filtering, the functional powder itself is easily recovered by taking advantage of its magnetic properties, and can be reused. The Nagano Plant was the first to adopt the new copper recovery system in Japan, and began using it in June 2012.



New Wastewater Processing Equipment

The new system, by enabling the recovery of copper in high concentrations, has increased the copper content of sludge to 90-95%, from around 15% using the previous system. It has also reduced the volume of sludge to one seventh (5 tons/month) what it was before, and reduced money spent on chemicals by 5.48 million yen. Processing time, as well, has been shortened - to 1 hour from 2 before - and the space for processing equipment has been reduced by about half.

Overview of the New System



Expanding Application of the System and Enhancing the Added Value of Recovered Copper

At present, we are aiming to use this new system for about 10% of the total wastewater from the Nagano Plant, with plans to gradually increase this figure. We are also considering the adoption of copper oxide conversion technology^{*4}, which has already been implemented within the Fujitsu Group, to process recovered copper into high-value-added copper oxide.

Going forward, the Fujitsu will continue to proactively reuse resources and reduce waste generation.

^{*4} Copper oxide conversion technology:

Technology that, through reaction processing of copper chloride and copper hydroxide, creates copper oxide.

VOICE

Masahiro Yazawa, Fujitsu Facilities Limited, Facility and Environment Services Division, Nagano Plant

Until now, I have been actively engaged in bottom-up environmental activities, like the use of geothermal heat for the air conditioning system of the Nagano Plant's clean room. The development of the new wastewater treatment system was another example of how a project got its start from frontline facility operators, including me, stepping away from conventional thinking to discuss new ways to handle problems. In the beginning, there were some struggles when the filtering process did not produce the expected results. The engineers, operators, maintenance people and others participating in the project, however, contributed their expertise and know-how in a unified effort to identify problem causes, and solved the problem by changing the process flow. Maintaining this kind of initiative going forward, we are already considering future projects, which might take on challenges like recovering heat from wastewater, creating a small-scale hydroelectric power system, or making even more effective use of wastewater.

