

Development of Vertical Electropolishing Facility for Nb 9-Cell Cavity №2

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In May 2018, at the IPAC-18, we made our 1st historical report regarding our last 5 years of continuous R&D work on vertical electropolishing (VEP). In the last few months, further improvement has been made targeting good VEP results, system automation, and cost-effective mass production. This 2nd report shows these improvement of the VEP facility. The detailed experimental VEP results are reported by Mr. Nii in TUPO067, and Dr. Chouhan in TUPO068.

1. Development of Ninja-Vertical EP system



Acid tank



Auto valves



Cavity on vertical EP stand

VEP system was designed to use it with our unique Ninja cathode. The system includes acid tank, auto-controlled valves, lower chamber for acid flow bifurcation, Ninja rotary system etc.



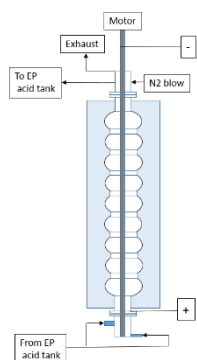
Acid tank

2. Advanced acid tank

The acid tank is made of clear PVC material and has a 70L capacity. In order to do EP with the least amount of EP solution, the solution is changed every one or two times of VEP process. Make sure the deterioration of the solution doesn't affect the EP finish. The tank is equipped with a niobium heat exchanger for liquid temperature control. The tank also has mesh filters and an ultrasonic oscillator used to remove hydrogen gas bubbles remaining in EP solution.

3. Automatic controlled valves for EP solution control

For automatic control of EP solution path and direction, electric switching auto valves are used. The operation of valves are controlled with programmed sequences. This allows to select the acid and water flow from bottom to top and vice-versa. The acid and water flow rate can also be remotely controlled with a touch panel screen.



VEP flow diagram



VEP



Touch panel screen



Auto valves

4. Ninja-VEP system

EP solution is inflowed from the lower chamber, and the Ninja cathode is spun. A unique characteristics of the lower chamber is that it can bifurcate the EP solution and allow separate flows in the cathode housing and cavity. This process removes hydrogen gas bubbles quickly from the cathode and cavity.

5. Post-EP Process

After EP, the EP solution is drained from the cavity and the interior surface of the cavity is rinsed with pure water. The cavity is then goes to the high pressure water rinsing process.



Ultrasonic-rinsing process