(007W)

Conclusion: Dawn of Tube Production in Japan By H. Ohtsuka

As everybody knows, Japan was a late comer for vacuum tube development compared with western countries. Therefore first production of **Spherical Audion** was approximately 10 year behind in Japan. But fortunately, TEC (changed company name to Toshiba in 1939) had a family tie between GE (and RCA), and NEC was associated with Western Electric (and STC). Therefore, once started development program, they picked up its essence quickly, and made their copies first. JRC, another forerunner in Japan, started work by himself first, but a little later, showed influence from Telefunken which he was associated with.

For that reason, it is only natural to see that majority of our early products were equivalent or similar to those of our teachers.

Look at table (015L) included here. This table was made by an idea of editor trying to compare how Japanese tube industry followed up U.S. and European tube development trail. As it is impossible to list all tubes developed in each year, picked up only representative ones forming one line in the particular year. Although it is difficult to visualize the whole situation, it may give you some idea for how Japanese tube production has chased U.S. and European development.

You can see that it became considerably shorter. For example, production of **UV-200** / **201** was 3 year behind U.S. If you compare it with **Spherical Audion**'s case which took about 10 years as described above. It may suggest that Japan's speed catching up new technology at that time.

You may also notice that many, if not the most, of our products bear similar type numbers which you can easily find their sources, mainly U.S.

Please find some photo copies in (001P) which we have on display at UEC (University of Electro-Communications) museum in Tokyo. We must admit that there are relatively few specimens here mainly because of the editor who is practically managing old tube section in our museum was out of country for too many years, and when he came back to his home country, majority of good items were already gone. Here, we must admit weakness particularly in transmitting tubes, microwave tubes, etc. We have few specimens of them, of course, but decided not to list in this report.

Talking about transmitting tubes, editor was quite surprised that NEC had a unique start in developing them. Most companies in the world started producing transmitting tubes from real small ones. But NEC was an exception. He has started tube development a little late in time, and many people understand that he was specialized in wired telephone tubes like WE's 101, 102 and 104 series. But actually, NEC has started transmitting tube development from large water-cooled tubes. The first one, **TW-504-A** (c.1933) was 15kW output, and the second one, **TW-502A** (c.1935) had 120kW output. Please find information on pages 2-4 in (005W).

Editor found an impressive photo of **TW-502A** (page 11 of same literature), but could not find similar one like this double-ended water-cooled tube anywhere. Wonder if he had a partner in the world at that time? WE does not list such a tube (according to "75 Years of Western Electric Tube Manufacturing" by B. Magers, etc.). Maybe STC in U.K. gave their know-how in this area.

Going back to the photo copies (001P), you may notice that there are a series of RCA type metal tube made by Toshiba, and few by NEC. The Toshiba models are in the oldest style of RCA types, but editor wonders how Toshiba secured special machinery necessary for manufacturing them. It was 1935 when RCA announced its introduction, and the outbreak of war in Pacific Ocean was in 1941, only 6 years in between.

Among WW II tubes Toshiba has produced, **Sola** (means sky) and **Umi** (means sea) may be of your interest. The former, similar to **12SJ7GT** (**MG**), was a standard sharp-cutoff pentode, but Toshiba could not produce big volume of button stem at that time, and therefore had to use pinch stem instead. At that time, Dr. E. Nishibori hinted applying a conductive coating (like aquadag) on the surface of stem for reducing capacitance between G_1 and anode. And **Sola** was designed so that even untrained women can assemble them, and from geisha girls to noble ladies worked in the factory or even in their home. At that time, JRC has introduced **FM-2A05A**, an improved model of German **NF2**. It was similar to **Sola** and **RH-2** (one of the other series by Toshiba), but had better performance including much lower $C_{p\cdot g}$. The Japanese military offices forced to produce them, but JRC could not do well as the tube was too difficult to make. In that situation, **Sola** was to fill the gap even with somewhat inferior performance.

As to **Umi**, there was a long time rumor for existence of this tube as a pair to **Sola**, but actually, nobody knew what it looks like. But last year, multiple specimen were appeared on Japanese internet auction, and editor was lucky enough to get them. It was a direct-heated diode with a slim coaxial anode, and in fat MT- like bulb with special 3 pins which is totally against people's imagination, and can not tell what it was used for. We will welcome for any information on **Umi**.

Another samples of metal tube are by NEC. Look at their photo in (001P). **MC-804-A** is not well documented, but **MB-850** is similar to **6SH7**. Their construction looks like WE's Klystron, etc., and again a question arises for how NEC secured manufacturing machinery at that time.

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