



Modernization program of Cyclone[®]18/9 at ASAN Medical Center, Seoul

ASAN Medical Center, Seoul, South Korea (<http://www.amc.seoul.kr>)

The Cyclone[®] 18/9 at ASAN Medical Center

The IBA Cyclone[®]18/9 was installed at ASAN Medical Center in 2001 and was integrated into a radio-pharmaceutical facility that originally produced from F-18 and C-11.

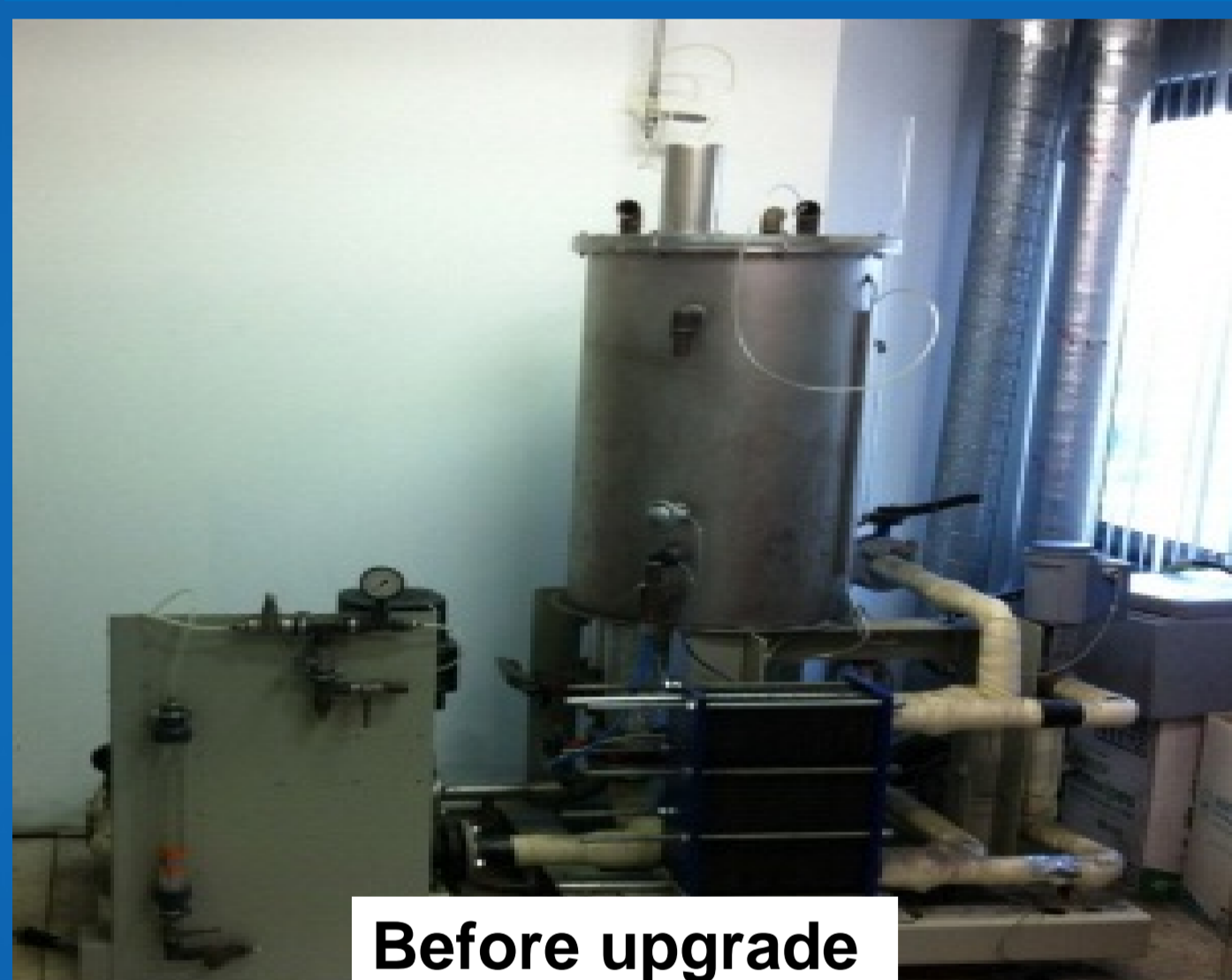
Some subsystems have no more spare parts and some problems remained.

In April 2015, the cyclotron was upgraded to the latest equipment generation and to extend the lifetime of the equipment as the modernization program.



Cyclotron before upgrade

Secondary water cooling system



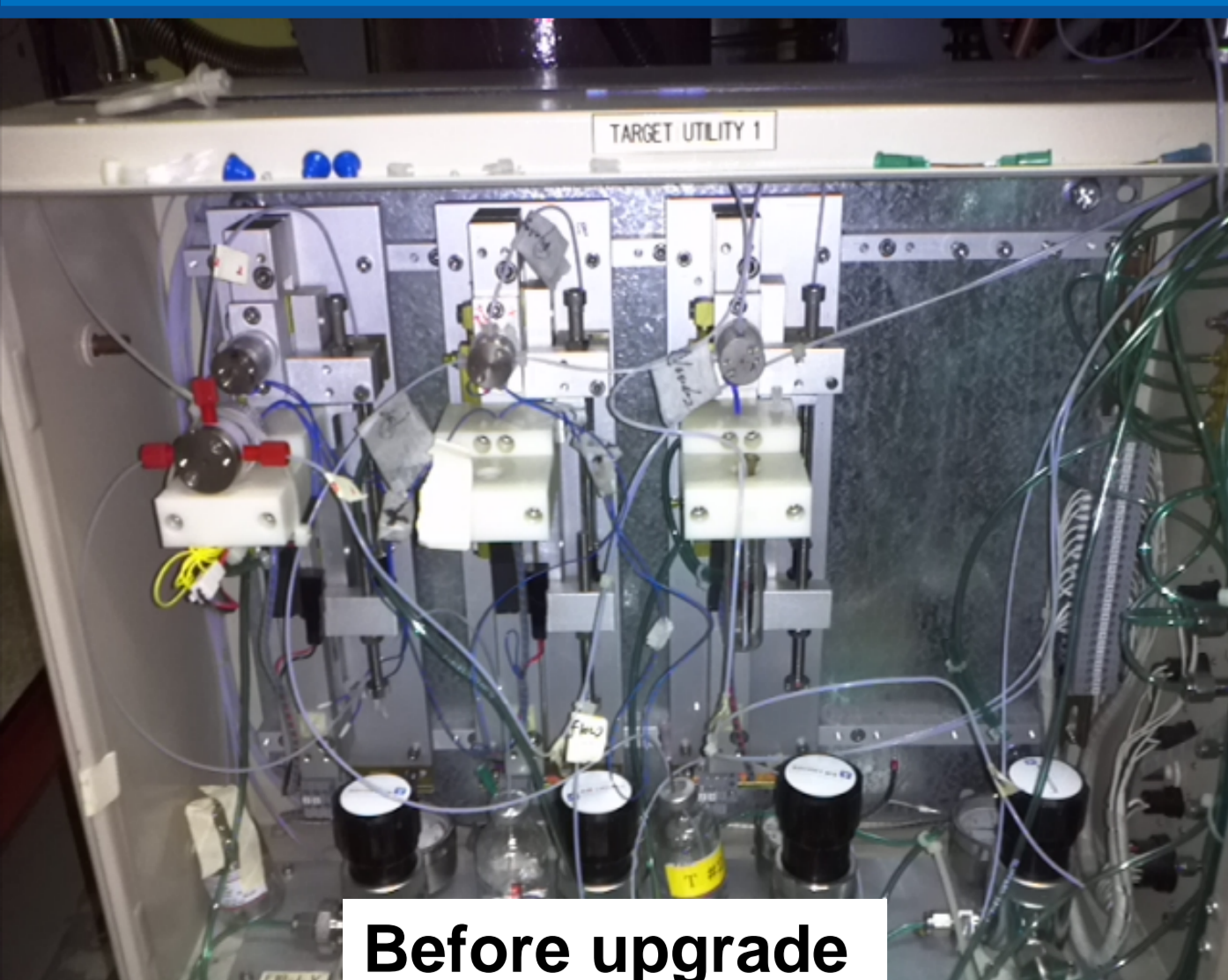
Before upgrade



After upgrade

New water cooling system have two pumps, the small one is for only vacuum system continuously and the other is for others when they are needed to work. This is very calm and reduce the stress on each system saving working time of pump. The temperature measurement signals are sent back and managed directly by the S7 PLC.

Syringe loading system for O-18 water



Before upgrade



After upgrade

One new electric syringe actuator(with Ethernet connection) dedicated for enriched water F18 Target filling. There are two similar boxes, one is for enriched water and the other is for rinsing water.

This new electronic syringe actuators for F-18 Target filling & rinsing were installed outside the Cyclotron vault(Cyclotron operating room in our case). Therefore, Operators do not need to enter the vault to verify enriched water level inside.

New central region, Dee's and Dual proton sources



Before upgrade



After upgrade

The Cyclotron central region, Dee's and counter-dee's were upgraded to be adaptable for Dual proton source (Cyclone 18/18) with the latest generation of ion source body (improved cathode holders, lower gas leak and in stainless steel).

RF Amplifier, LLRF and Magnet Power Supply



Before upgrade



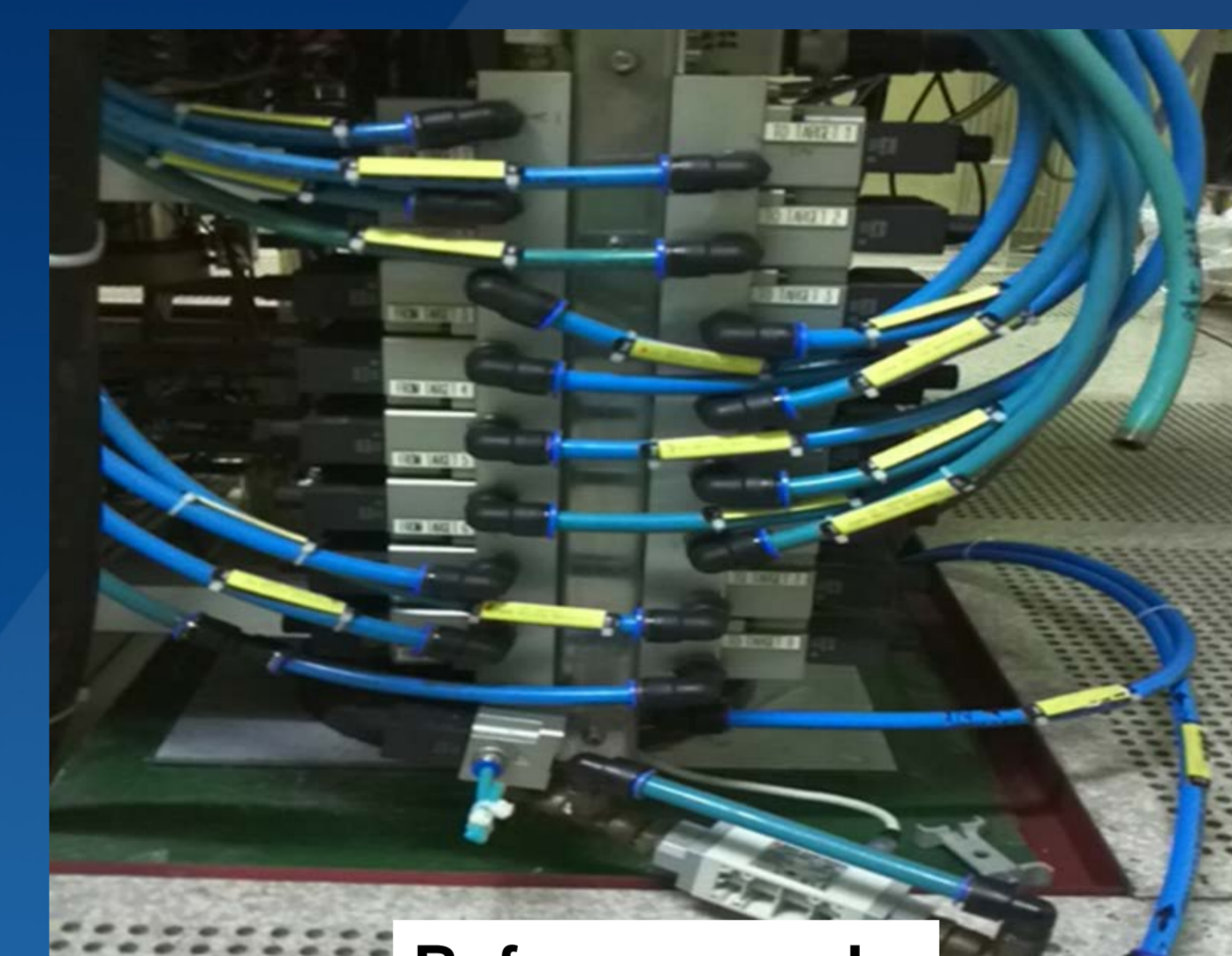
After upgrade

Old Henry Radio was replaced to New 12kW (mono-frequency) IBA RF Final Power amplifier. Heliax RF Power cable between the RF amplifier and the RF coupler was changed to bigger one. RF coupler and electrical cavity tuning system with LLRF were also replaced to new one.

New Magnet power supply use no water cooling any more and is compatible with previous power supply(3x400Vac + N, 50~60Hz input / 155, 125V output).

New latest Ion Source power supply is also compatible with previous unit(3x400Vac + N, 50~60Hz input / 3kVdc, 2.5A, 1kW output).

Helium cooling system & valves



Before upgrade



After upgrade



New Helium cooling system have heat exchanger with water cooling and no centralized Helium manifold(distributed ASCO Helium valves). Stainless steel wide piping distributed around the Cyclotron for much reduced in-line pressure drop in the He distribution. The latest KNF He compressor perform high flow with double-head & water cooling.

Conclusions

This big modernization program was very meaningful project in South Korea. The project was the First trial in South Korea because ASAN Cyclotron was quite old and there is nationally no case regarding discarding of Cyclotron. IBA team respected the situation, and the collaboration with Nuclear Medicine in ASAN Medical Center was performed.

Cyclone18/18 is now ready for the future. Upgraded machine can be expected lifetime has been extended more than 10 years with new subsystems.



Cyclone 18/18, Cyclotron after upgrade

ASAN Modernization program capacitated old machine to increase to higher performance simultaneously with saving the cost (money and closing time). In addition, Upgraded Cyclone18/18 provided less tasks for maintenance and lower dose for personal radiation to use. This program didn't make old site have new installation of expensive machine on the another place(due to decay of previous site for long time) for more than 3 months.

IBA team planned the program for 4 to 5 weeks at the moment of beginning, but they advanced a week(20% of the total) to make 1st production to use even if they had to replace almost subsystems.