INTRODUCTION

- EAST (Experimental Advanced Superconducting Tokamak) is the first full superconducting experimental Tokamak fusion device.
- EAST has been carried our ten campaigns since the end of 2005.
- The cryogenic system is to cool down the superconducting magnets and relating components.
- The total cold mass of EAST is about 250 tons.
- EAST cryogenic control system (ECCS) is based on DeltaV DCS of Emerson Corporation.
- Many control components have been running beyond the expected lifetime.
- This paper presents the current status and upgrade solutions of the cryogenic control system.

Basic parameters

- **Equivalent Refrigeration**
  - ~3.5kW@4.5K(+Shield Cooling)
- **2 Refrigeration Cycle**
  - Modified Claude Cycle with 3 turbines (LHe temperature level)
  - Brayton Cycle with 1 Turbine (80K for thermal shields)
- **Temperature level**
  - 4.5K/3.5K
- **Oil ring pump to reduce pressure**
- **Cryogenic Users:**
  - SC magnets (TF/PF/CS coils & Cases)
  - HTS Current leads
  - THS Shields
  - Cryopumps, NBI, inject pellet

Current Status of Present System

- Operate on Windows NT operating system
- New hardware have no drive supports
- The manufacture have no supports for old DeltaV version.
- New instrumentation and new solutions can not integrate in DCS system
- The performance of control system gradually decrease.
  - The load of MD controller is approach to 90%;
  - Historical data query is slow and operational management efficiency decreased
  - The communication efficiency decreased with error rising, occasional packet and network clogging

Upgrade to the new system

- Upgrade of DeltaV system
  - The DeltaV version upgrade from V6.3 to V12.3
  - Windows NT upgrade to Windows 7
  - PC’s and switch will be replaced
  - New Profibus DP card will be installed in the DCS system
  - PI database will be replaced by SQL database.

ECCS based on EPICS

- EPICS will be the framework software
- The central I/O system will be converted to the Profinet field bus.

CONCLUSION

- The upgrades of EAST cryogenic control system have been discussed in this paper.
- There are one near term and future plan for the upgrades. The DeltaV system upgrades have been implemented on September 2015 and will be tested in the new EAST campaign.
- In the future, the new EAST cryogenic control system based on EPCIS will be designed and implement