12 GeV Upgrade Cavities

- **Production process** – press for reliable efficiency
  - **160 µm BCP** and pre-tuned **by vendor**
  - Receipt inspection – mechanical and rf
  - US >> Bake: 600 C, 10 hrs
  - US >> EP: **30 µm, @20°C** regulated by external water spray
  - US >> Tune
  - Helium vessel welding
  - Flange lapping
  - HPR
  - Partial assembly
  - HPR >> dry in Class 10 cleanroom
  - Final assembly, leak check
  - Bake: **120° C, 24 hrs**
  - Vertical test @ 2.07 K
  - HPR >> dry in Class 10
  - String assembly

No benefit from bulk EP, BCP is quite sufficient (as would be CBP)

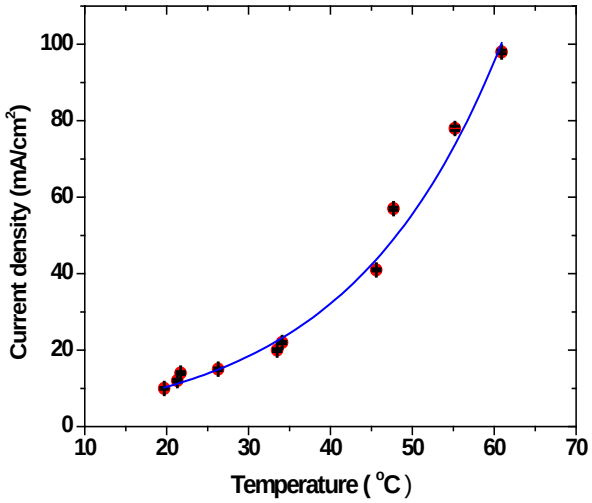
Note that tuning and HV welding follow final EP

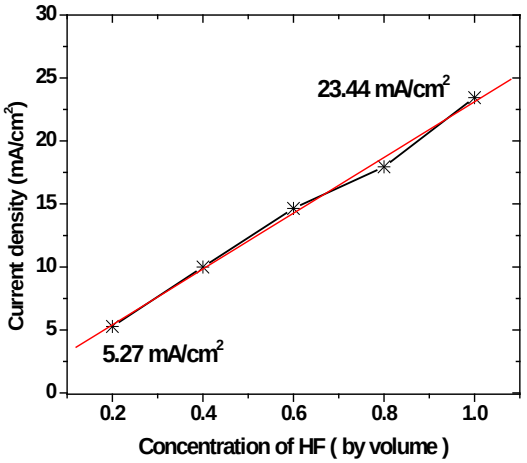
and

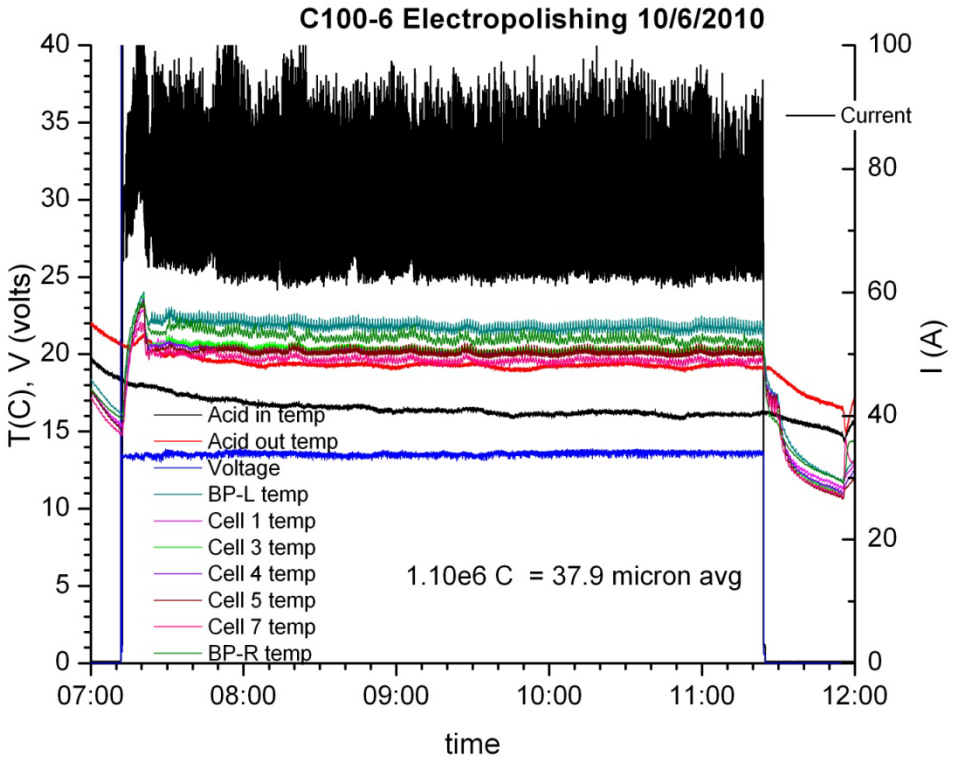
24 hr 120 C bake is quite adequate

A. Reilly et al., *Preparation and Testing of the SRF Cavities for the CEBAF 12 GeV Upgrade*,"**TUPO061** this conference.

Anode Current Density Strongly Depends on Local Electrolyte Temperature & HF Concentration







The Nb anode plateau current density is directly proportional to the bulk F concentration, increases with temperature, and is independent of the amount of dissolved Nb.

Courtesy of 1) F. Eozénou et al. CARE-report-2008-022-SRF, 2) H. Tian, C. Reece, et al. J. Electochem. Soc. 155(2008), p. D563

Implications of basic understanding of EP
Positive Results from Controlled Light EP After BCP

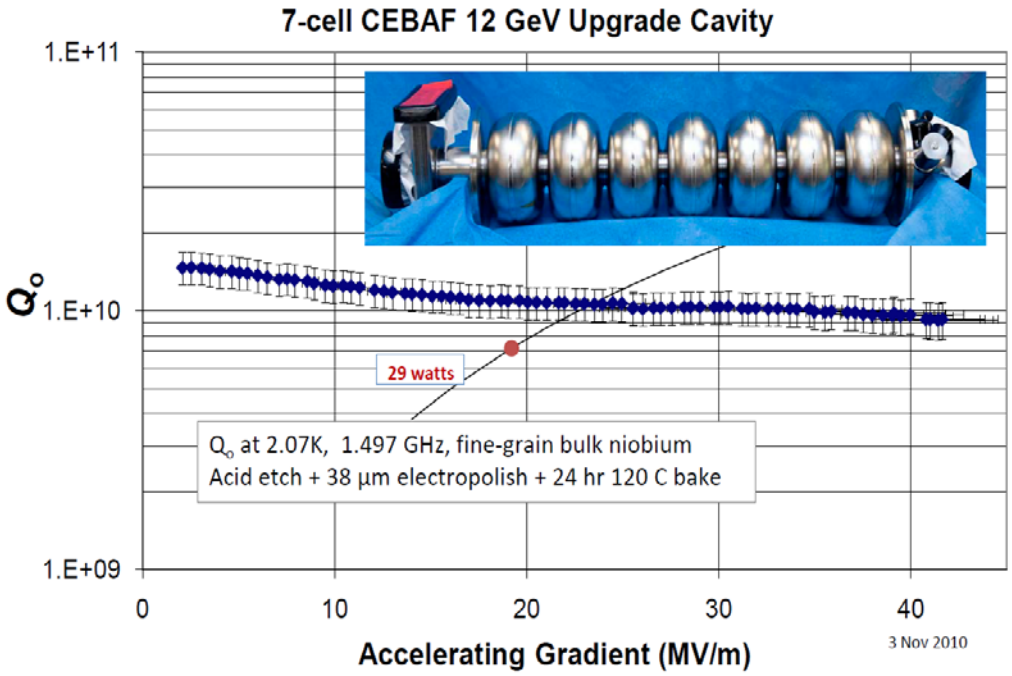
For a well controlled, high reproducibility, efficient, reliable EP process.

✓Control and "minimize" the temperature as much as is practical.

✓Minimize cathode current density, and over-potential (increase cathode surface area, improve reaction kinetics for hydrolysis).

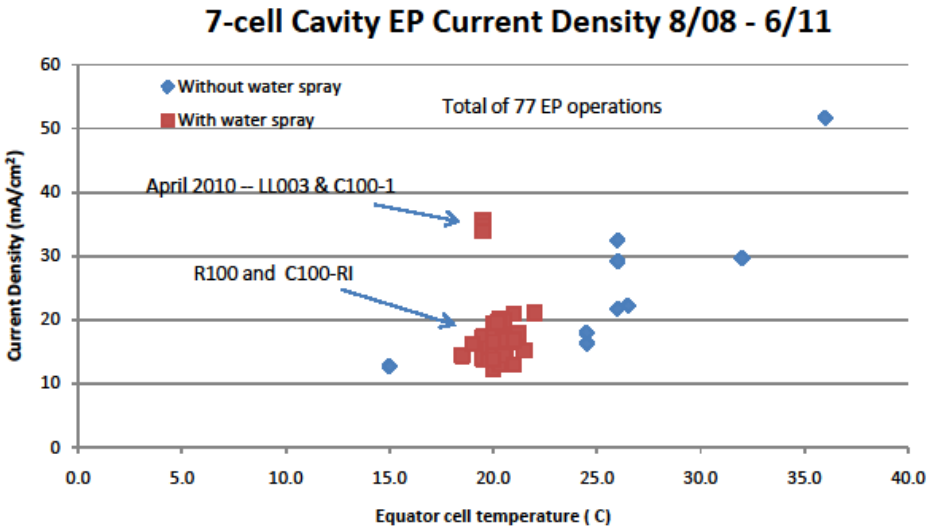
✓Start with surfaces that are consistently smooth below the scale of diffusion layer thickness, such as CBP (if objective is maximally smooth surfaces with minimum chemistry).

✓Manage hydrogen bubbles and other forced or natural convection for maintaining a controlled local surface flow dynamics .

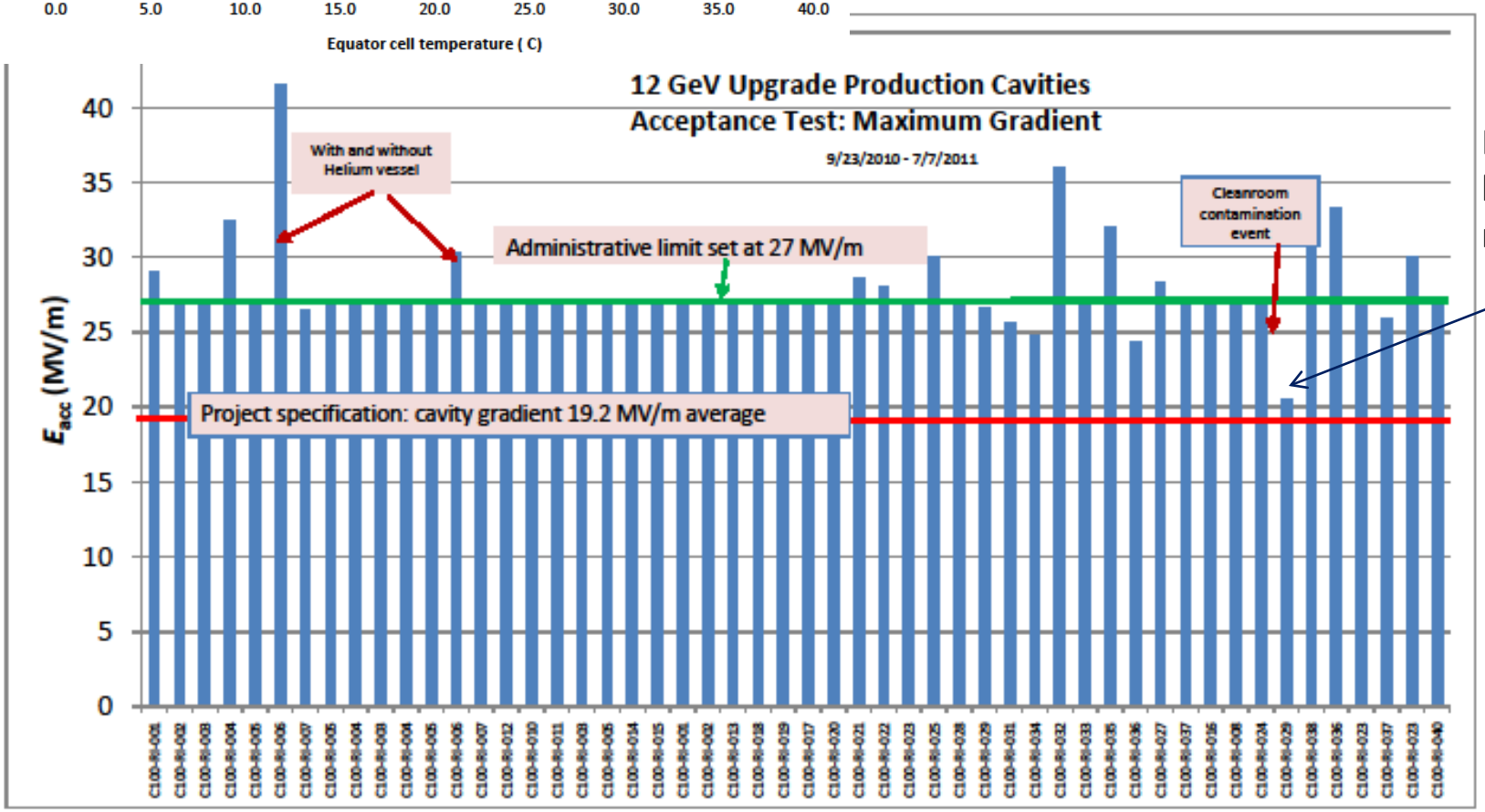


12 GeV Upgrade Project adopts it as an alternated baseline for the 80 cavities, the on-going production progresses steadily.

"Preparation and Testing of the SRF Cavities for the CEBAF 12 GeV Upgrade", A. Reilly, T. Bass, A. Burrill, K. Davis, F. Marhauser, C.E. Reece and M. Stirbet.



Production results to date for 12 GeV Upgrade



FE limited – to be HPR and retested