

An Introduction to the FUTURA pico for Mini-bioreactors

INTRODUCTION

Small bioreactors are gaining share in process development laboratories. It is vital that these bioreactors are realistic scale down models of larger systems and it is equally important that online sensors for measuring live biomass can also be used in these vessels.

ABER; known and trusted for its sensors that measure live cell concentrations using capacitance technology and adopted in the world's leading bio pharmaceutical companies from R&D through to cGMP processes brings you the new FUTURA PICO. Our Conventional sensors have typically been placed in vessels 5 litres and over in R&D to large stainless steel vessels in manufacturing.

The Aber biomass system is now a vital part of many advanced bioreactor system and the probes are commonly used for controlling critical feed rates or for maintaining constant cell concentrations in perfused systems. With the technology based on capacitance also being available in a single use format, the Aber probe is a critical component in many new cell processes that are scaled up into cGMP production. And now with the introduction of the Futura PICO, users will be able to use the robust and trusted capacitance measurements at a much smaller scale, as well as allowing users to introduce PAT to evaluate critical parameters in to their process far earlier than ever possible before, supporting the acquisition of key data to ultimately expedite time to market and return on investment for leading Biopharmas.



PRINCIPLES OF MEASUREMENT



Bio-Capacitance measurement is based on the principle of dielectric spectroscopy, whereby an alternating electrical field is generated by an Aber probe, which polarises live cells with an intact membrane which is impermeable to charge (dielectric) thereby restricting the free flow of ions. This allows a capacitive charge to build up around the cell membrane. The probe simultaneously to the emission of the electrical field, detects this capacitive charge build up, or capacitance signal, and is proportional to the live bio-volume of the cells present. Unlike other methods of biomass measurement Bio-Capacitance does not measure dead cells, gas bubbles debris, or microcarriers.

Up until September 2017, the Aber probes have been available in wide range of configurations but in either 12mm or 25mm diameters.



The new Futura PICO system launched at BPI Boston in 2017 has a unique, patented 7.5 mm diameter probe that can be autoclaved or steam sterilized in situ. The four pure platinum electrodes are beneficially positioned to maximize the current path between the electrodes around the tip of the probe body and produces a smaller symmetric field of measurement compared to other capacitance based probes, while having a comparable performance to other probe configurations in the Aber range (Fig. 1a & b).

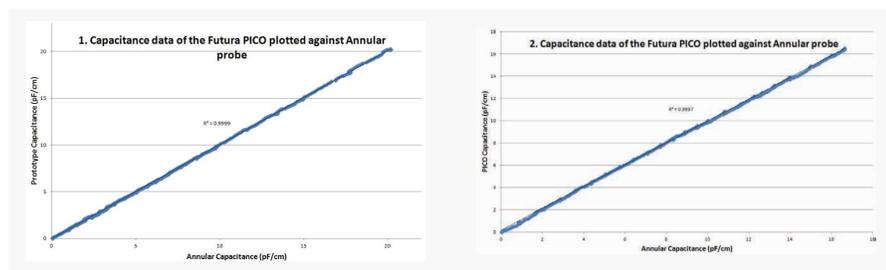
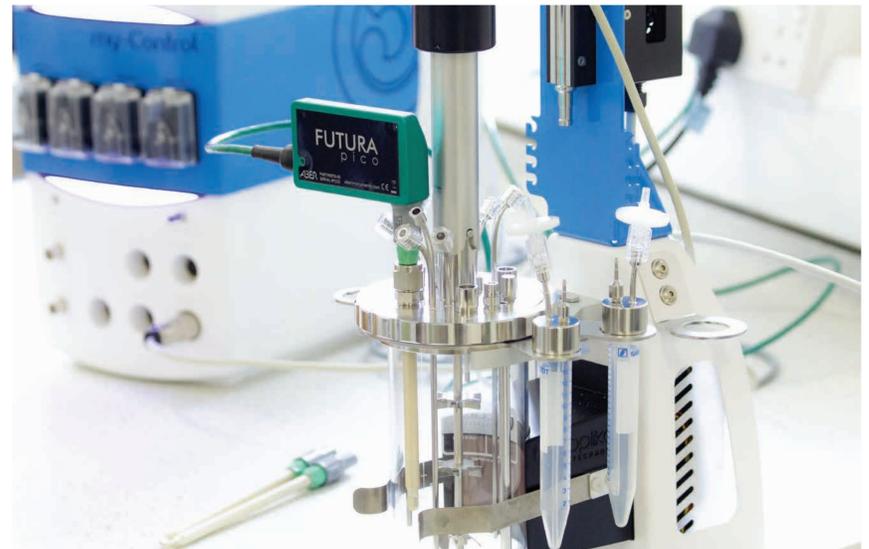


Figure 1a & 1b. Comparative plot of the capacitance values of the Futura PICO against an Annular probe during the step change study. R2 values of 0.9999 & 0.9997 indicate a highly significant correlation.

The PICO probe displaces a minimal culture volume and can be placed just a few millimetres away from the side wall and other parts of the vessel making it ideal for use in bioreactors of 500ml and less. The PICO probe connects to the smallest and lightest available head amplifier on the market and utilizes the latest generation of capacitance based electronics from Aber. The PICO system is set up so that the capacitance readings from the live biomass will be the same as generated by the Futura systems with the larger annular or flush style probes.



The small footprint and compact electrode configuration make the PICO probe ideal for use in wide range of mini-bioreactor systems. Applications are already being opened up for using the probe in 3D Cell culture or in mini vessels with volumes less than 20ml. Aber has the ability to produce customized probes so if you need a specific configuration then contact one of our specialists in either USA or UK.

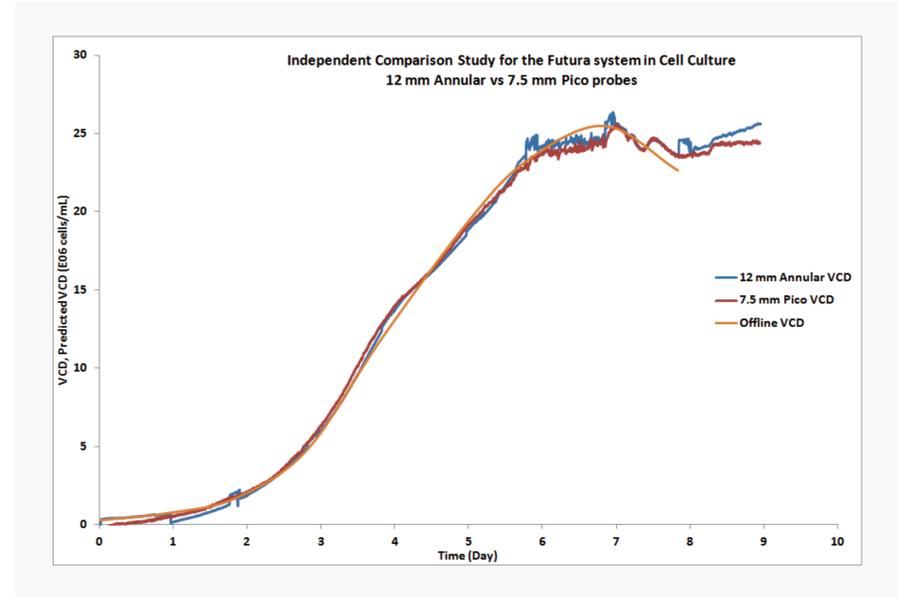


Figure 2 Showing an independent Futura system comparison study between the 12 mm Annular probe and the newly launched 7.5 mm Pico for measuring a cell culture process. Both probes were placed in a Dasgip Benchtop reactor. As can be seen from the figure, the performance of both probes was highly comparable and the cell concentration trends followed each other nicely. In addition, both probes correlated very well with offline viable cell density measurement.



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