Do I Need A Contact Angle Analyzer?

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This note will provide a guide for determining whether a contact angle analyzer is useful for you and what type to get. If you already know contact angle measurements are useful to your application, go to the second box.

I. Determine the Applicability of Contact Angle

- it is useful to understand the motivation for measuring contact angles: they offer an easy-to-measure indication of the chemical bonding of the uppermost surface layers. This bonding determines wettability and adhesion. For a brief discussion, see FTÅ's ***What are Contact Angles?*** application note. The primary motivation is to be able to predict wettability or adhesion from contact angle measurements, but they can also be used as coating or trace contaminant detectors.

- contact angles are the commonly seen physical manifestation of the more fundamental concepts of surface energy and surface tension. You can take either a theoretical approach and deal with these energy values or you can take an empirical approach and deal only with contact angles. Either approach may be better for your situation--the important concept is that contact angles are related to surface energy and tension.

- contact angles, surface energy, and surface tension allow you to put numbers on what have been qualitative and rule-of-thumb descriptions. Numbers allow you to say "how good" and "how much to spare" in describing cleanliness, surface treatments, and coatings. Numbers give you a way of comparing today's results with next year's.

II. Ways First Ten Ångstroms Can Help You

- if you are already familiar with contact angle measurements and want a single sample run to demonstrate instrument capabilities, FTÅ will do this without charge.

- if you would like multiple samples run to determine sensitivity or specificity, FTÅ will perform this service at $500 per day in our factory laboratory. This service includes discussing the nature of the specimens with you, running the experiments, and providing a written report.

- if you would like to explore the use of contact angle measurements in your facility, you can rent the FTÅ125 system for $950 per month. This is an easy-to-use system that will have you making measurements quickly.

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III. Quality Assurance or Research?

- the FTÅ125/150 systems are designed for quality assurance and quality control, where simplicity and economy are most important. These systems provide totally automatic analysis, so operator training is absolutely minimal. In exchange, they provide only the most basic measurement, whereas research systems will provide multiple types.

- the FTÅ200 systems provide the researcher with tools to carry out a variety of experiments, approaching a problem in different ways. They are appropriate to academic and industrial research laboratory environments.

IV. Application Questions

- are contact angles sensitive enough? The sensitivity of contact angles to many substances is extremely high, being able to detect a fraction of a monolayer on a surface. Contact angles are extremely sensitive to surface, rather than bulk, composition.

- are contact angles specific? This means do they respond to other things, beyond what I am interested in? This is sometimes the case. Contact angle measurements respond to bonding energy rather than specific chemical compounds. Different molecules can have similar energies, so this must be checked. So while one can determine surface energy, one can not specify chemical composition.

- is the spatial resolution satisfactory? Contact angle measurements are made by placing a drop of fluid on a surface. This drop has a definite physical size, and may be too large for the feature you wish to investigate. The basic FTÅ200 systems are "macro drop" systems and deal with microliter quantities which form drops measured by one or more millimeters. The more expensive FTÅ400 systems are "micro drop" systems which can deal with nanoliter and below volumes and achieve spatial resolutions below 100 microns.

- is the timing resolution satisfactory? Absorbent materials and surfaces which experience hydration require sufficient time resolution to follow these dynamic phenomena. The FTÅ125/150 quality systems make measurements about once per second, whereas the FTÅ200 and 400 systems are high speed, with at least .016 second resolution.

- how much application knowledge is required? The FTÅ125/150 quality systems require very little study or training, since they report a contact angle and the basic surface energy value without any operator intervention once a sample is in place. You can profitably use these instruments to sort surfaces or fluids into good/bad by correlating other process attributes to contact angle ranges. These systems offer the most reliable contact angle/surface tension measurements available for the factory floor. The FTÅ200 and 400 systems are, by comparison, complex and make more sensitive and sophisticated measurements. These require an understanding of surface chemistry to fully appreciate.