

A Guide to FTÅ Video Drop Shape Software

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This tour of the FTÅ Video software is for the new user and for those wishing to inspect the software on a demo basis.

Installation. Install the software on the hard disk of any Windows compatible computer. While there are specific requirements for the computer to acquire images from the instrument, there are no requirements to run the software as a demo, other than about 20M of hard disk space.

Instrument owners should follow the detailed instructions provided with the equipment. They will need the license diskette shipped with the machine, but demo users do not require a license.

Demo users can only analyze the demo images shipped with the software; they can not acquire or import other images.

Movies. All of the operation of the software is organized around the concept of a *movie*, which is a database containing both video images and numeric results from image analysis. Both are contained within the single movie file. Each movie corresponds to one experiment, or one run. A movie may contain just one image, or it may contain hundreds of images, depending on what the operator requested.

Operation of the instrument, then, consists of three phases:

- Setup instrument for a run
- Acquire (or capture) a movie
- Analyze the movie for contact angle, surface tension, etc.

Different Models. The FTÅ line consists of both an industrial series (the 100 series) and a laboratory series (200 and above numbers). The software is similar for both, but some of the

features and controls are not present in the industrial series. Keeping this in mind, the following discussion will presume FTÅ200 software, which is also the basic demo software.

Starting the Program. When the software is started, the user sees a screen with a typical menu bar plus three forms, or windows, on the workspace:

- Live Video (blank for demos)
- Video Setup (only affects Live video)
- Movie Setup

If you are running the instrument, you will now adjust the video image for focus and contrast, as well as composition (what you are looking at).

The Movie Setup form has tabs to control lighting, the syringe pump, capture timing, and actual acquisition. (The FTÅ100 line only takes Snap Shots, i.e., single images; it does not take movies.)

As an exercise, click on some control (e.g., a radio button or a checkbox) on a tab in Movie Setup. Now hit the F1 key. Context sensitive Help will be started automatically. The on-line Help function is your guide to all of the details of running the program. A printed manual version of this file is available to instrument owners.

Opening A Movie. The next step is to open a pre-recorded movie. Click on File in the main menu, then Open Movie, then navigate the dialog box to the application directory, which is the folder containing the program being run. Open demo_1.mdb (“mdb” stands for Microsoft data base). Your screen should look something like Figure 1 on the next page. (FTÅ100 series users can open pre-recorded movies, even if they can not acquire them.)

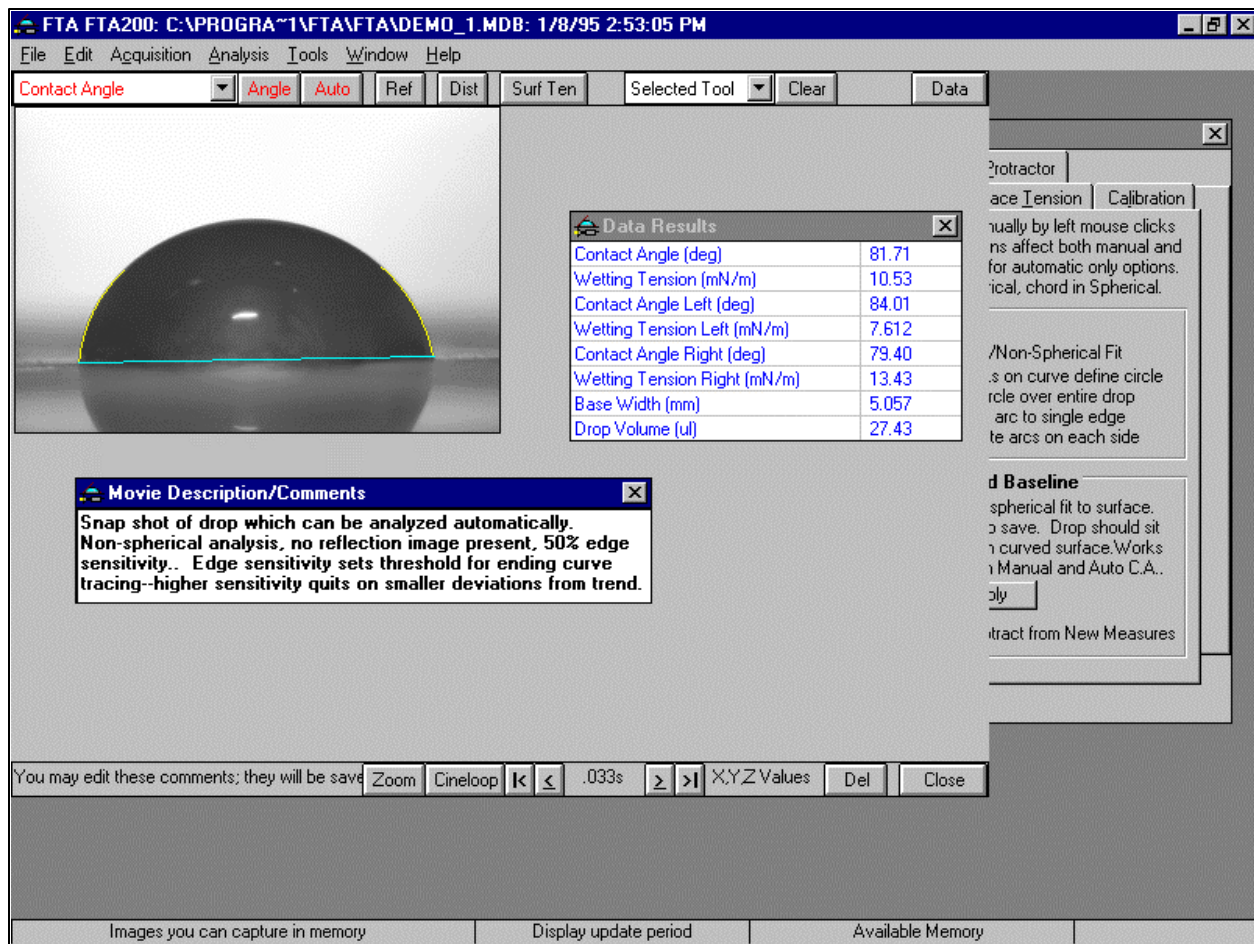


Figure 1. Demo_1.mdb opened.

Comments are provided to describe the run. The user can add his own. Results from image analysis are shown in the Data Results box. These will vary depending on what type of analysis is performed on each image. Finally, at the bottom center of the Movie form is a time, in this case .033s. This is the time into the run that the image was acquired; this particular movie is a Snap Shot with only one image.

Image Analysis. Partially hidden in Figure 1 is the Image Analysis Setup form shown in Figure 2. These tabs control the algorithms which perform the image analysis. If you wish, you can try them out on the demo movies. Actual analysis is invoked by the command buttons at the top of the Movie form, e.g., Angle, Auto, etc. Anything that you do to a movie is immediately stored on disk, as this is a database. If you need to preserve the original, make a copy before beginning. Demo users can obviously always reload the software.

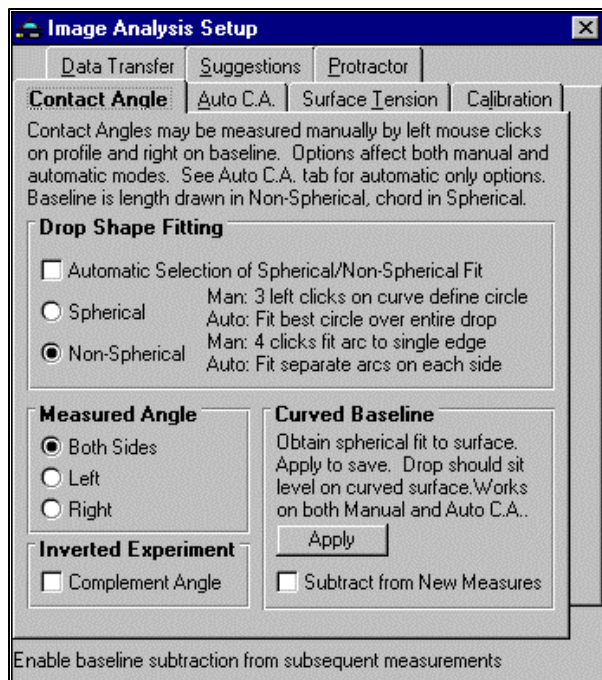


Figure 2. Image Analysis setup form.

Dynamic Measurements. We will now open a movie containing a number of images and graph the data as it changes in time. Open demo_6.mdb. This shows water absorbing into kraft paper. The contact angle and drop volume change as a function of time. The first image, Figure 3, shows the pendant drop before it detaches from the dispense tip and settles on the sample.

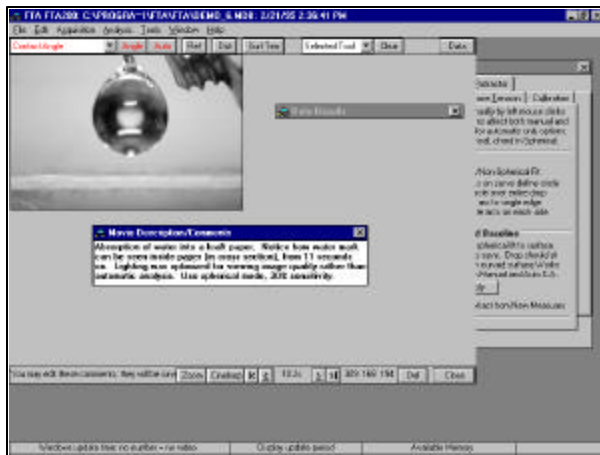


Figure 3. Beginning of absorption run.

The time into the run is 10.2s on this image. This is the time it took the pump to form the drop to this point. By clicking the > and < buttons at the bottom of the form, you can move forward and backward in the movie, image by image. Cineloop will play the movie continuously. Zoom will give a closeup of the portion of the image pointed to by the mouse. Figures 4 and 5 show drop images early and late in the absorption process. After clicking through the images to get a feel for them, click on Analysis/Graph, Averaging, Table Data in the main menu.

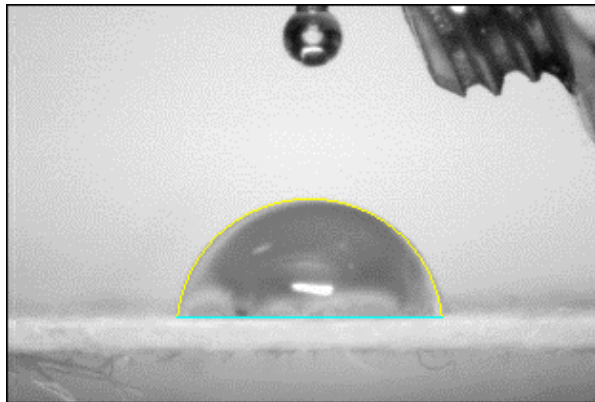


Figure 4. Drop sitting on paper.

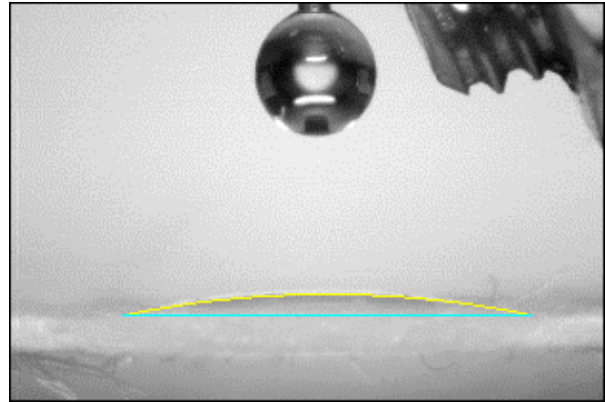


Figure 5. Drop absorbing into paper.

This will bring up a graph of the contact angle as a function of time, as shown in Figure 6.

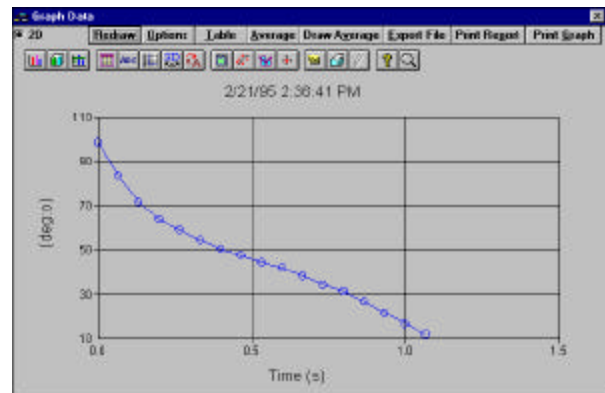


Figure 6. Graph of time-varying contact angle.

A wide variety of different things, such as drop base width, area, and volume, can be plotted from the image analysis data. An example of such a plot is shown in Figure 7, which is an *exported* version of the graph that you can paste into a report or word processing document.

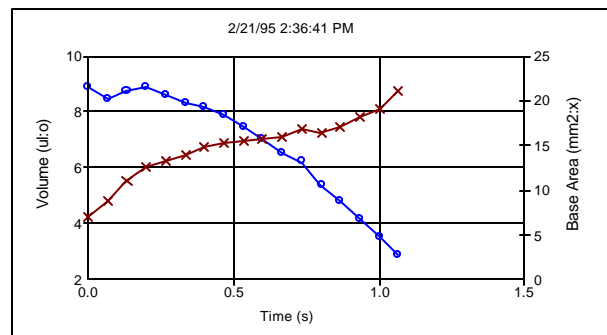


Figure 7. Graph of drop volume and base area showing spreading and absorption.

Surface Tension Measurement. Demo_7.mdb shows a pendant drop surface tension measurement of an expanding drop of water. The purpose of expanding the drop is to show there is no influence of drop size on the measurement, and also to illustrate the general resolution of the measurement, which is about 1/2 mN/m. Figure 8 shows the first image from this movie.

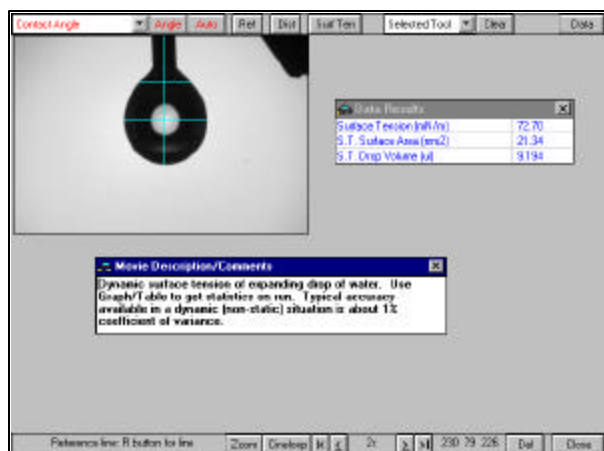


Figure 8. Pendant drop surface tension image.

Figure 9 shows the graph of surface tension as a function of time. The initial graph display will be with an expanded scale. To get the scaling used in Figure 9, click on the colorful tool bar button with the little grid and “1 2 3”. This will open the setup tabs for the graph and should get you to the Axis tab. Click the radio button for Zero Origin in the Scale frame, then Apply. The graph should change to look like Figure 9. Many other things, such as titles, colors, etc., can be set in these tabs. The graph can also be saved as a file or printed from these.

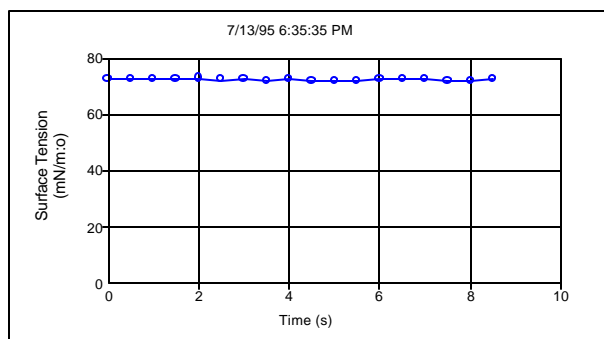


Figure 9. Graph after scaling.

Surface Energy Calculation. Additional things can be computed from contact angle and surface tension data. Some of these require running several experiments and combining the data into a single calculation. Click on Tools/Surface Energy in the main menu, and the form shown in Figure 10 will appear. Contact angle data from different fluids on the same sample surface may be combined in sophisticated analyses such as the Lewis Acid/Base model. Several models are offered to accommodate different types of samples and the level of detail required.

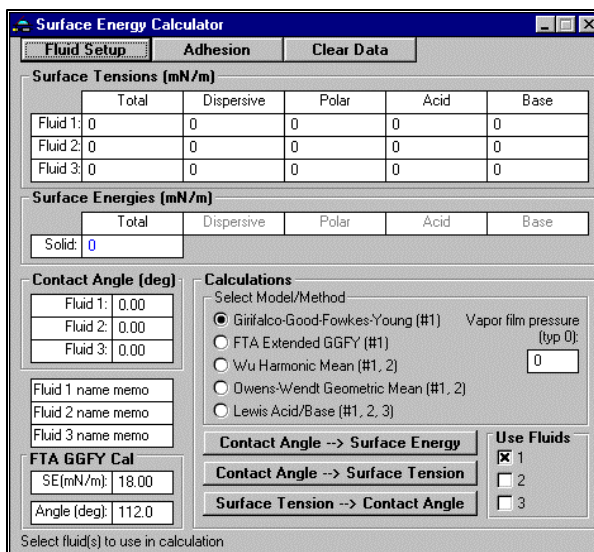


Figure 10. Surface energy calculator.

Summary. This is only a sample of the features and capabilities of the FTÅ Video software. The following papers, available from FTÅ and its distributors, explain the methods in greater detail:

- *A New Dynamic Contact Angle System*
- *Two-Dimensional Contact Angle and Surface Tension Mapping*
- *FTÅ200 Measurement Capabilities*
- *Contact Angle Measurements Using the Drop Shape Method*
- *Surface Tension Measurements Using the Drop Shape Method*
- *Dynamic Surface Tension and Dilational Stress Measurements Using the Drop Shape Method*