

# EVALUATION OF THE SPECTREX LASER PARTICLE COUNTER MODEL PC-2000 (ABSTRACT)

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## A. Sample considerations

1. Sample size: Bottle size 20 to 200 mm inside diameter
2. Sample flow rate: N/A, instrument counts particles in-situ (with flow cell, flow is 100 ml/min) until a total volume of 10 ml has been scanned.
3. Sample throughput
  - a. set-up time: 30 minutes warm-up plus calibration check of the 3 calibrated suspension bottles, total 40 minutes.
  - b. Analysis time per sample: 15 seconds for air bubble removal, plus 15 seconds for the scan, plus 30 seconds for data printout (if personal computer is used).

## B. Operating Considerations

1. **Environmental conditions for operation: not specified**
2. Routine maintenance:
  - a. Procedures were described for cleaning the optics. This was recommended if the calibration changed. Frequency for this operation was not specified.
3. Factory maintenance:
  - b. No regular factory maintenance is necessary, unless site conditions are dirty. Calibration will indicate this problem.
4. Operator skill level requirements
  - a. **Support Documentation:** The manual covered all aspects of instrument operation.
  - b. **Instrument Assembly:** Component assembly was quickly and easily accomplished.
  - c. **Instrument Set-up:** Procedures were given for checking and adjusting instrument optics alignment and verifying instrument calibration using the manufacturer's prepared calibration solutions.
  - d. **Instrument Operation:** Was simple and straightforward with or without the personal computer attachment. The manufacturer provided sealed calibration

standards which enabled quick verification of counting and sizing status. Optically-clear, scratch-free and scrupulously clean (inside and out) glassware was required for successful sample analysis. We used bottles supplied by the manufacturer, and got best results when the sample bottle was oriented in an identical manner relative to the scanning laser for each analysis.

- e. **Troubleshooting:** Troubleshooting guidance was not provided in the manual for electronic or sample-related problems.
- f. **Data Presentation and Interpretation:** Data presentation with the personal computer attachment was excellent. Especially noteworthy was the display of the histogram of the counts in each size channel and the calculation of mean particle size. The sizing channels were available in three formats: a) from 1 to 16  $\mu\text{m}$ , in 1  $\mu\text{m}$  increments, b) from 17 to 92  $\mu\text{m}$ , in 5  $\mu\text{m}$  increments, and c) these two modes combined.

### C. Data Acquisition Reduction and Storage Capabilities

With the personal computer attachment, particle sizes in 16 or 32 channels were determined in a single analysis. The histogram display was an excellent way for the operator to assimilate particle size distribution information. Also, the mean particle size was calculated for each run. Particle size distribution was available as particle diameter, area, volume, and phi distribution. The software was capable of subtracting out background counts and correcting for dilution of the sample. Data from analyses could be stored on disk using the software package.

Without the personal computer attachment, this instrument operated as a single channel particle size analyzer, counting particles greater than the user-set threshold (minimum size 1  $\mu\text{m}$ ). Multiple channel information could be obtained by repeatedly running the sample using different thresholds. In this mode, there were no data acquisition and reduction capabilities.

### D. Suitability for Water Treatment Applications

The strengths of this instrument for water treatment applications were its ease of operation, the calibration check samples supplied by the manufacturer, and the non-invasive nature of the measurement technique which left the sample intact. The optional software had noteworthy features, such as the bar graph representation of particle size distribution and the calculation of mean particle size.

### E. Finally

A new software program has been developed whereby individual sample counts, their histograms, size listings, etc. can be stored in memory for future recall and also data can be transmitted to Lotus 1, 2, 3 or any other spreadsheet program for storage and/or data manipulation. Also, it is now possible to average out a series of counting scans to give one resulting histogram and count listing. This improves accuracy and repeatability. The "automode" software permits continual monitoring of flowing streams, stores the data in memory, and provides data readout in compact and easily readable form.