- **Jet-in-crossflow liquid column & spray analysis**
  - spatially resolved
  - time-resolved
- **Intact Liquid**
  - Break point
  - Angle/trajectory
- **Spray properties output**
  - drop diameter
  - drop velocity
- **Fast calculation times**
  - Process 1000's of images in an hour
- **Flexible user interface**
  - Graphical User Interface with contextual help makes getting started easy
  - Text Input File option allows efficient batch mode operation
- **Works on any .AVI file**

Please inquire for pricing and availability!

Contact Info

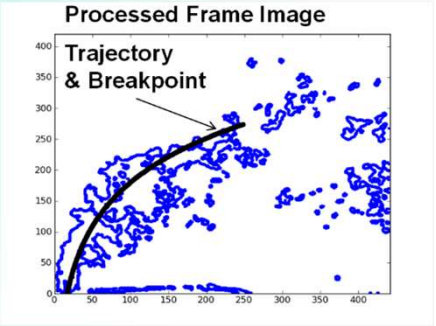
Energy Research Consultants
23342 South Pointe Dr. Suite E
Laguna Hills, CA 92653
www.ERC-Ltd.com

Christopher Brown
949.583.1197 x 101
Brown@ERC-Ltd.com

AFEAT

Automated Feature Extraction Tool

AFEAT



ERC
ENERGY RESEARCH CONSULTANTS

v. 10/20

Model Overview

For many applications involving liquid injection, the ability to predict the details of the breakup process often is limited due to the complexity of the two-phase phenomena. Likewise, the ability to experimentally characterize these phenomena is limited, in part due to the need to rely upon visualization tools that are inherently qualitative. As a result, experimental validation of predictions from analytical atomization models or advanced computational fluid dynamic (CFD) simulations is limited.

Visualization diagnostics have evolved substantially in terms of spatial and temporal resolution. Coupling these advancements with an analysis tool to conveniently quantify the results obtained relative to the breakup process offers the potential for a marked increase in understanding of this phenomena. To address this need, ERC developed an automated feature extraction tool (AFEAT), that can be applied to the problems of liquid injection into a crossflow and liquid breakup and dispersion from pressure swirl injectors.

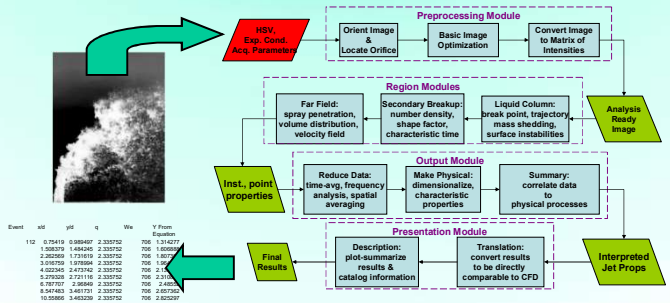
Input

- AVI File or set of TIF files from imaging system

Processing

Once the file(s) is read in, AFEAT does pre-processing to clean up background, orient the image, and carries out an interaction with the user to register key features and calibrate pixels to distance

AFEAT then carries out operations on each frame to isolate critical regions in the spray including the intact liquid region, the post breakup region, and the background. Using numerous image processing methods, quantitative information about these regions are extracted for each frame and reassembled to allow for time resolved information to be realized



Output

- Intact Liquid
  - Boundary
  - Penetration/Angle
  - Intact Liquid Breakpoint Motion
- Spray Droplets
  - Position
  - Velocity
  - Diameter

Correlation Development

By applying AFEAT to parametric experiments, it is possible to quickly develop design tools based on 1000's of images.

Examples for a liquid jet in crossflow include:

Penetration:

$$\frac{y}{d_o} = We_c^{-0.05} q^{0.5} \left[1.46 \ln\left(\frac{x}{d_o}\right) + 1.5\right]$$

Column Breaktime:

$$t_{break}[ms] = 64 We_c^{-0.58} q^{-0.34}$$

Breakpoint Motion Dominant Frequency:

$$f_{instability}[Hz] = 4.62 \times 10^{-2} We_l^{0.464} d_j^{-1.416}$$