

# KehlCo Inc. VoxelCalc Features Summary

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*VoxelCalc runs on Windows, Unix and Linux operating systems. It includes many features designed to provide the scientist or engineer with numerical, computational and (interactive) visual answers in a form for publication of reports and sharing of results. It has a calculator feature which enables the user to direct sequences of mathematical operations on 3D data to extract and derive physical and spatial property maps.*

**Cyan** highlighting indicates significant features, **yellow** highlighting indicates special computations.

## MAIN PANEL MENUBAR

ICON Button VoxelCalc

**Calculator** – Performs math operations on slice arrays, filtering and data type conversions.

MENU Control

**Exit** – Quit VoxelCalc, discard all data

**Reset All** -Resets the main interface to default conditions.

**Clear** - Clears all memory contents and the main display memory

**Retain Range** - Holds the display range for fetching new images. (a toggle)

**Pixelate** - Shows pixels at the scanned resolution rather than interpolating the images for display (a toggle)

**Grid** - Turns on/off main display grid. (a toggle)

**Enumerate** - Turns on/off enumeration of displayed slices (a toggle)

**Retain Write Directory** - File outputs are defaulted to the last chosen path (a toggle)

**View Log** – Show/Hide a display of the VoxelCalc log of selected user actions (a toggle)

**Measure Settings** - Parameters for converting pixel/voxel sizes to engineering unit measurement of 3d distances

**Measure** – Enable/Disable measurement of 3d distances with mouse (toggle)

MENU Image File

**Write "hdf"** – Save displayed data in a standard binary format, readable by PetroPresents and VoxelCalc (Browser)

**Write "fld"** - Save displayed data in a binary format compatible with PetroPresents and AVS.

**Write "dat" Binary Slices 0...n** - Save displayed data in a binary format for future VoxelCalc reading. Slices are numbered.

**Write "dat" Binary Volume** - Save displayed data in a binary format for future VoxelCalc reading.

**Write Binary Image(s)-Stripped** – Save displayed data in binary form (stripped or “raw”) for use in other applications. Images are named with dimensions. Readable by Import tool.

**Write Binary Slices 0...n** - Exports displayed data in a binary format for export (to ParaView, for example). Slice files are numbered.

**Export ASCII Table** – Saves displayed data in row-major text format. Useful for import to spreadsheets.

**Export ASCII xyz (raw)** – Saves displayed data in four columns text: X, Y, Z and Value

**Import Image(s) Tool** – Reads foreign binary data with user guidance.

**Publish Each Image** – Saves each display image in a publication file format – jpeg, tiff, gif, etc.

MENU Render

**MindOverMatter3D** - provides interactive visualization of 3-D data in VoxelCalc display memory. This is a high performance rendering tool which utilizes transparency, and visualization of slabs, isosurfaces, glyphs, and much more.

**Cross Plot** – Plots display data against Memory #1 data.

**Ortho Slab** – Displays axial slabs of display data.

**Surface** - Makes mesh and shaded surfaces from currently focused slice values.

**Isosurface** – Renders an Isosurface of displayed data under user control.

MENU Statistics

**Histogram Spreadsheet** – Calculates slice and volume histograms and classifies data

**Histogram Tool** – Graphs histograms of displayed images several ways.

**Statistics (Profils+)** – Provides several modes of displaying current slice statistics, profiles, table, etc.

MENU Color

**Load Image Colors** – Provides selection of several color maps and skewing of them.

**Load Plot Colors** –Loads 16 colors for annotation and plotting and overlays them atop color table.

**Edit Colors** – Provides color manipulation one at a time and building of custom color tables.

**Equalize** – Equalizes the distribution of colors across the values in display memory.

**Unequalize** – Restores map after equalize

**Load Default Map** – Loads map that user has set as default.

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**Set Default Map** – Sets the default map used at startup

**Load KehlCo Map** – Reloads the default KehlCo color table.

**Std Colors** => List of maps from PV-Wave

**Custom Colors** => List of maps from KehlCo or user.

**Color=>Legends**

CT Number Horizontal – Color legend for displayed memory values

Dual Horizontal - Color legend for displayed memory values and Calibrated quantities

CT Number Vertical - Color legend for displayed memory values

Dual Vertical - Color legend for displayed memory values and Calibrated quantities

## MENU Special

**Resize 3-D** – Resamples displayed memory with interpolation.

**Volume Movie** - Provides a "fly through" of slices in display

**Porosity Distribution** - Calculates and displays porosity distributions

**GeoRadiograph** - Extracts objects using Range limits, stacks them vertically and adds a plot of relative density as a depth log.

**Density-Atom # Calibrate** - Provides calculation of true density and effective atomic number images from dual energy scans - usually at 120kev and 80 or 90 kev. This is done in two steps - Calibrate and Calculate.

**Density-Atom # Calculate** – See above.

**Align** – Translates displayed images under user control to align first and last slices of array.

**Connectivity 3-D** – Locate, map and extract voxels with similar attributes (vugs, fractures, inclusions) and calculate volume and boundaries.

## MENU Plug-Ins

Menu items that are customized features for the licensee company...

## MENU ROI (Region Of Interest)

**Define ROI** - To extract the area (polygon, circle, rectangle) within slices that include meaningful objects and exclude the remainder or background values. Also can produce statistical tabulation file. A Save ROI function allows the ROI information to be retrieved later using the File Browser. Once defined, the ROI can be used as a mask to read slices and volumes.

**Rectangular Crop & Adjust** - Adjusts CT images in which the object scanned is rectangular. This is an arbitrary adjustment and should be used with care; however, it can be used to adjust these images to more nearly agree with the CT values found in circular cross sections of the same object.

**Crop Below Range** – Crops displayed data based on Range settings by finding the minimum size slices that can contain all pixels within the Range min/max.

**Beam Hardening Adjustment** – Adjusts CT images to remove beam hardening artifacts.

MENU Help => Introductory help for new users

## BROWSER DRIVEN TOOLS MENUBAR

*The browser provides the means of building 3D volumes from most CT and MRI data formats including DICOM in any slice order from multiple directories. KehlCo provides licensees with plug-in readers for special data formats. The following tools operate on lists chosen in the browser, as a means of optimizing memory and gaining significant processing speed.*

**Info** - Provides a display of image header information for selected files with extensions ".250" and ".idf".

**Fly Through Slices** – Displays slices at a rate of no more than one per 1.5 seconds.

**Publish Picture Groups** – Produce image groupings from selected slice files as a sequence of image files.

**Slabs** - Slabs images selected in file browser using Measure Settings and Range. Produces X and Y slabs in display memory with proper aspect ratio.

**ROI/Beam Hardening** - Performs beam hardening adjustment using currently defined ROI and a list of images selected in the File Browser.

Adjusted images are saved to the subdirectory "Processed" These saved images will have the extension of ".dat" and are in PV-Wave variable save/restore form

**A op B Calculator** – Slice pairs are scaled and then combined using basic binary arithmetic operations - +, -, X, /.

**Density & Atomic # (Dual Energy CT)** - Density and/or Atomic number calculation to be used after the main menubar function

Special=>Density Atomic # Calib(rate) function has be performed. It writes slices of density and optionally atomic number maps to subdirectories of the source image data.

**Cross Plot Tool** – Produces a cross plot color map of two properties whose volumes are comprised of and equal number of slices.

**Saturations, (Two Phase)** - Provides the means of calculation of saturations from 3 slice arrays - Oil, Water, Total. This tool uses the File Browser to establish lists of each of the slice arrays.

**Histogram Spreadsheet** – Tabulations are provided for Basic Statistics, Histogram and Classes.

**Histogram Volume Graph** - Produce a cumulative histogram graph for the selected files

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**Import** - Binary files which the system has not been programmed for may be read. Selection of such a file causes a panel to appear and the user may then define some rules for reading all files which have the same extension. (See Import)