Flenser user guide

Flenser is **a liquid light show** — oil, water, alcohol and dye between two watch glasses on an overhead projector — as an FFGL source and effect for Resolume Arena and Avenue, and an OpenFX generator and filter for DaVinci Resolve, Nuke, Natron and Vegas.

Cells of oil press on each other and join with a fillet. Each one is a dye filter, so where two cross they **multiply** — cyan over magenta is blue, not white. The meniscus at every edge is a lens that displaces what is behind it, splits it by wavelength, and throws a bright caustic just inside a dark rim. Behind all of it is a condenser with a hot spot, a colour temperature and a round gate.

> **Before you rely on this:** released at **v0.1.2**. The model exists twice — once in GLSL for the GPU and once in C++ for the OpenFX build — and the two are measured against each other across **1.6 million values** over every control, with no disagreement past 5e-4. Both builds are separately proved to leave a picture exactly as they found it when the wheel is clear: **0 of 230,400 bytes** differ through the Resolume build, **0 of 921,600** through the OpenFX one. All 33 controls reach the picture, in both bundles.
>
> **What has now been checked in a real host, and what has not.** As of v0.1.2 both Resolume plugins load and register in Arena 7.27.1 on Windows — verified with the build this release ships, on a machine with no graphics card, so it says the plugin is correct and nothing at all about how fast it is. It has still never been loaded into Resolve, and the Linux build has never been run. Everything else above runs the plugin directly or runs the OpenFX bundle through a test host.
>
> Two of the things that were wrong before v0.1.2 were found by somebody running it on a real rig and telling us, not by any of the measurements above. Check it in your own rig before trusting it in a show.

Thirty-three controls, in seven groups. This is what each one does and, more usefully, what it does *with* the others.

If you read nothing else: **Cells**, **Merge**, **Density** and **Churn** are the four that decide what the wheel is. Everything else is adjustment.

The four plugins

	Resolume	Resolve / Nuke / Natron / Vegas
the wheel on its own	**Flenser** (a source)	**Flenser** (a generator)
the clip as the lamp	**Flenser Lamp** (an effect)	**Flenser Lamp** (a filter)

They declare the same controls and read the same presets. **Mix** does not apply to the generator, and neither do three of **Mode**'s four settings, because they are about a clip it does not have. The fourth, **Matte**, is not about the clip at all and both plugins honour it.

Wheel — what is on the glass

Cells — how many cells of oil, 1 to 48.

This is the one control that costs. The field walks every cell at every pixel, in both builds, and the OpenFX build pays it on the CPU. A real six-inch wheel holds a few dozen worth looking at; past that they get smaller than the rim treatment and the picture reads as noise rather than as liquid.

Size — the average cell radius, where 1.0 is half the frame's short edge.

Geometric, because the step from two cells filling the gate to four is a different picture and the step from forty-six to forty-eight is not.

Variation — how much the cells differ in size. At 1 the smallest is about a tenth of the largest, which is roughly what a dish that has been squeezed looks like.

Merge — the fillet where two cells meet. **The control that decides whether the wheel is holding beads or pools.**

At 0 the cells stay separate and pass straight through one another. That is not what a real dish does and it is the most useful setting the control has: a field of hard-edged coloured discs is a mask, a pixel-map driver and a title background. As it rises they pull into each other with a proper meniscus fillet, which is what oil in water does when the surface tension is beaten.

Note that the individual cell outlines stay visible however far this goes. In a real projection they do too — the cells are stacked in the few tenths of a millimetre between the glasses, not fused.

Spread — how wide the cells are packed. Past about 1.0 the outermost ones sit beyond the frame, **which is the normal way to run it**: a real wheel is bigger than the gate.

Scatter — at 0 the cells sit on a golden-angle spiral, which is the closest simple arrangement to a dish full of equal cells pressing on each other, and stays even at every count. At 1 they are a hashed swarm — a dish that has just been rocked. Anywhere between is a blend.

Seed — a different wheel, 1 to 9999. Not covered by the presets, on purpose: it is how you get a different wheel out of the same look.

Motion

Speed — cycles per second, 0 to 1.5. Zero stops everything, including the cells' slow breathing.

Each cell travels its own closed orbit on two *incommensurate* frequencies, so the wheel never comes back to where it was. A projection that loops every four seconds is the one thing an audience does notice.

Drift — how far each cell travels on that orbit.

Spin — the whole wheel turning in its holder, which is what the motorised units do. Bipolar: 0.5 is still, either side is a direction.

Churn — how far the noise field deforms the oil, **as a fraction of the noise's own wavelength**.

This is what stops the cells being circles, and it is the difference between a liquid light show and a screensaver. It is a fraction rather than a distance so that it does the same kind of thing at every Grain and cannot reach the point where it folds the field into a mess of contour lines.

Grain — how fine that noise is, 0.5 to 12 cells across the wheel. Low is a slow swell that moves whole cells; high is the boiling texture a projector gets after a few minutes on.

Boil — how fast the noise moves, 0 to 2 Hz. Zero freezes it, which leaves the cells deformed but still — a useful thing on its own.

> In Resolume, Boil is *integrated*: nudging it changes what happens next rather than rescaling the whole history and jumping the field somewhere else. In an OpenFX host it is `time × Boil`, because a host that renders frames out of order needs each one to be computable on its own. The difference shows only while the control is being moved.

Optics — what the light does on its way through

Density — how much of the lamp a cell's dye absorbs.

This is the control that makes the effect subtractive. Overlapping cells *multiply* their transmittances, so a cyan cell over a magenta one is blue, and a red one over a green one is nearly black. That is what a dyed wheel does and it is not what a stack of coloured blobs added together does. Put this up and watch two cells cross; the **Ink in Water** preset is built to show it.

Refraction — how far the meniscus displaces what is behind it.

An edge band, not a whole-cell distortion: the middle of a cell is flat oil between two flat glasses and bends light by almost nothing. All the optics are in the curved boundary at the rim. In **Flenser Lamp** this is the control that makes the footage visibly *behind* the oil rather than tinted by it.

Dispersion — red and blue displaced by different amounts. The colour fringe a thick edge of oil actually makes. Green is left alone, so the picture does not appear to move as the control opens.

Meniscus — the dark line at a cell's edge. Light hitting a steep oil-water boundary is thrown sideways instead of forward, and every cell edge in a real projection is dark for exactly that reason.

Caustic — the bright line just inside it, where the same curvature concentrates the light. Goes past 1 on purpose: a caustic genuinely *is* brighter than the lamp, and the clipping is what the eye reads as wet.

Rim — how wide the rim treatment is. At the bottom of its travel it is about a pixel, which is a projector in sharp focus; at the top it is a wide soft shoulder.

Colour

Palette — the dye set.

Aniline	the four bottles in a supermarket food-colouring pack, which is what the DIY version is actually made with
Ink	the subtractive primaries. Overlaps most cleanly, because they are what the effect is physically doing anyway
Sodium	the hot end only: red through orange to amber
Spectrum	continuous — every cell anywhere on the wheel
Duotone	two complementary dyes and nothing between them
Mono	one dye

Hue — rotates the whole palette.

Hue Spread — how far apart the palette's dyes sit. At 0 every cell is the same colour, which is a wheel charged with one bottle and a real thing to want.

Saturation — how strong the dyes are. Food colouring straight from the bottle is at the top of this; a wheel that has been run for an hour is not. At **0** the wheel is clear water and every mark on the screen is refraction, a caustic or a meniscus line.

Lamp — the projector behind the glass

In **Flenser Lamp** these describe what the projector does to your clip rather than what the lamp is. They are not hidden there on purpose: a hot spot, a colour temperature and a gate are things the footage goes through.

Lamp — brightness. 0.5 is unity, and the range goes to 2 because a dense dye at full saturation passes maybe a fifth of the light. Needing to push past unity to get a picture back is the accurate behaviour.

Hotspot — how much brighter the middle of the gate is than the edge. An overhead projector's condenser is a Fresnel lens and its hot spot is the first thing anybody notices about the format.

Temperature — bipolar. Below 0.5 is the cold blue-white of a metal halide head; above it is the amber of a tungsten overhead that has been dimmed.

Gate — the round gate's radius. Below 1 the disc and its edge are the picture, which is an overhead projector with a clock glass on it; **at the very top of the travel it is off**, and off means off — the frame is full and the corners are untouched.

Gate Soft — how soft that edge is. At 0 it is the hard circle of a projector in focus.

Simmer — Resolume only

Off by default, and it is the one part of the plugin that remembers anything.

Simmer carries a little of the previous frame forward, dragged along the churn field. It is the one thing the rest of the model cannot do: leave a trail behind a moving cell, because that needs to know where the oil *was*.

Smear is how far a carried-forward frame is dragged before it is blended back. It does nothing with Simmer at 0.

Two things worth knowing:

- At Simmer 0 the picture is **exactly** what it would be without the control — the same numbers, not nearly — so switching it on does not jump.
- It cannot run away. The buffer is a maximum against the live frame with a persistence below 1, so nothing in it can ever be brighter than the brightest oil that has been through it.

It does not exist in the OpenFX build. That host renders frames in any order, alone, on several threads at once, and a feedback buffer there either serialises it or renders differently every time. An effect that does not match its own preview on the second export is worse than one that is missing a control.

Output

Mode — what the clip is, except for the last one.

Project	the clip goes where the lamp was, and you are looking through the oil at it. The default, and the one the plugin is named for.
Over	the oil is lit by its own lamp and sits on top of the clip.
Colourise	only the clip's brightness is used, and the dye supplies all the colour.
Matte	no clip at all: the lit oil over transparency. Works in **both** plugins.

Matte is the one to reach for if you want the wheel to mask something else. The oil is lit by its own lamp exactly as in Over, but instead of being laid on a clip it is laid on nothing — so everywhere the oil does not cover, the picture is transparent, and because the output is premultiplied it is black there too. A host that ignores alpha still gets the black field; one that does not can key it, put it on a layer above other visuals, or run it through a blend mode.

It is the only mode that renders identically in the generator and the effect, which is worth knowing: if you are using Matte, it does not matter which of the two plugins you reached for.

Two things it is not. It is not a way to get *Over* out of the generator — Over needs a clip and the generator has none, and Matte is what you would use instead. And it is not an alpha the wheel's own shape gives you for free: what sets the transparency is how much light each pixel actually intercepts, so a pale dye at low Density cuts a fainter matte than a saturated one does. Turn Density up if you want a harder edge.

Mix — dry/wet against the untouched clip. **Flenser Lamp only.**

Recipes

A wash to sit under titles. *Slow Bloom*, then Density down to about 0.4 and Mix to taste. Three enormous cells barely moving.

A mask or a pixel-map driver. *Beading*. Merge at 0, Saturation at 1, Rim low — hard-edged coloured discs with no soft shoulder to confuse a mapper.

Footage genuinely behind glass. *Clear Water* on **Flenser Lamp**, Mode Project. No dye at all, so nothing is tinted; every mark on the picture is the lens.

The DIY article. *Overhead Projector*, then Gate down to about 0.55 for a smaller clock glass and Speed up a little if it is too static for the cue.

Something that boils. *Alcohol Burn*, then Boil up and Grain up together. Watch that Churn stays where the preset put it — it is normalised against Grain, so raising Grain does not make it wilder, it makes it finer.

What it costs

The field walks every cell at every pixel. So:

- **Cells is linear** in render cost. Forty-eight is roughly four times twelve.
- **Simmer adds a pass** at full resolution, and is skipped entirely when it is zero.
- **Everything else is free.** Refraction, Dispersion, the rim treatment and the whole lamp are a fixed handful of instructions per pixel whatever they are set to.

`./build/fltest --bench` prints the numbers for your own machine.

When it does nothing

The log is the first place to look:

```
~/Library/Logs/flenser/flenser.YYYY-MM-DD.log
```

It records the GL vendor and version, any shader that would not compile, and any buffer the driver would not allocate. Those are the three failures that look identical from the operator's side — the effect simply does nothing, with no message anywhere.