

R-4106A: Better Refrigerant, Blocked Market

What R-4106A is, why it beats R-454B, and why the OEMs are fighting it.

R-4106A is not a drop-in replacement for R-454B. It is a drop-in upgrade. It goes into the same equipment with no oil change, no seal change, no TXV recalibration, and no control reset — and then it outperforms the refrigerant it displaces, at about \$100 less per cylinder, blended in Clayton, North Carolina.

And despite the letters going around, the OEMs have no decision to make here. Whether a refrigerant reaches the market is decided by EPA — no equipment manufacturer gets a vote, holds a veto, or ever has, in thirty years of the SNAP program. An OEM letter can tell you what the OEM won't warranty. It cannot block a refrigerant. Those letters are a preference defending a price, not a decision — the decision belongs to EPA, and the choice after that belongs to you.

And you don't have to take anyone's word for it — you can test it today. Field evaluation quantities of R-4106A are available right now for testing and field verification. Put it in a system. Put your gauges on it. Run it against the numbers in this brief — capacity, glide, pressures, superheat — and see for yourself. The OEMs won't test it. You can. Call us and we'll get evaluation gas to you. Full market launch follows EPA's letter of completeness and the 90-day notification window that starts with it — FluoroFusion will notify the market when that window has run. The testing starts today.

- **Smallest changeover in SNAP history.** You change the refrigerant. Nothing else changes.
- **More capacity, more efficiency.** +5.0% to +8.5% capacity and +1.4% to +3.9% COP vs. R-454B, across nine standard operating conditions.
- **Near-zero glide in service.** Effective evaporator glide runs ~0–2 °F on a real system — the CO₂ fraction's pressure drop cancels the composition glide. The bigger numbers you may hear are constant-pressure table values, not what your gauges see.
- **Safer within the A2L class.** Higher worst-case LFL than R-454B (13.2 vs. ~11.8 vol%) and a slower flame (5.3 vs. 7.0–7.5 cm/s). Same class, more margin.
- **Easier to haul and store.** DOT Class 2.2 Non-Flammable for transport, warehouse, and truck stock. R-454B and R-32 are Class 2.1 Flammable.
- **97.3% less TFA.** About 37× less trifluoroacetic acid formation than R-454B, per the peer-reviewed atmospheric literature (Tewari et al., 2025).
- **GWP 681 — under the federal 700 limit.** Regulatory equal of R-454B on virgin production; near-zero net GWP when made from reclaimed feedstock through FluoroFusion's patented process (U.S. Patent 12,540,265 B2).

1. Head-to-Head: R-4106A vs. R-454B

Sources: DEKRA ASHRAE 34 testing (Dec. 2025); NIST REFPROP cycle analysis; Tewari et al. 2025; Madronich et al. 2023.

Metric	R-454B	R-4106A	Advantage
ASHRAE Safety Class	A2L	A2L	Equivalent
WCFF LFL @ 60 °C (vol%)	~11.8%	13.2%	R-4106A: less flammable
Max laminar burning velocity	7.0–7.5 cm/s	5.3 cm/s (WCF); 5.66 cm/s (WCFF)	R-4106A
GWP (AR4, 100-yr, virgin)	466	681	Regulatory equivalent (both < 700)
Net production GWP (reclaimed)	N/A	≈ 0	R-4106A
Cooling capacity vs. R-454B	Baseline	+5.0% to +8.5%	R-4106A
Efficiency (COP) vs. R-454B	Baseline	+1.4% to +3.9%	R-4106A
Effective glide (in service)	~1.5–2 °F	~0–2 °F	Essentially equivalent
Discharge pressure vs. R-454B	Baseline	+2.6% to +2.8%	Within design margin
TFA formation per kg	~311 g	~8.4 g	R-4106A: 97.3% less
DOT transport class	2.1 Flammable	2.2 Non-Flammable	R-4106A: simpler logistics
Blended in	Partial domestic	Clayton, NC — USA	R-4106A
Price per 20-lb cylinder	Premium	~\$100 less	R-4106A

The safety line that matters: R-4106A's worst-case LFL is higher than R-454B's. Equipment listed for R-454B under UL 60335-2-40 — charge limits, leak detection, mitigation — is designed against a more flammable refrigerant than R-4106A. Every safety margin carries over, with room to spare.

2. Why the OEMs Are Pushing Back

One reason: money. Refrigerant is recurring revenue. The manufacturer whose gas fills the installed base collects on every service call, leak repair, and recharge for fifteen to twenty years per system. A refrigerant that drops into their equipment, outperforms their spec, and costs \$100 less per cylinder is a direct threat to that stream. The warning letters are a commercial defense of a price — not a scientific finding about a refrigerant. Every claim in them has an answer:

What the OEM letter says	What's actually true
"Not approved under EPA SNAP."	It's under review. Once EPA's completeness letter arrives, a 90-day window runs — then FluoroFusion notifies the market and R-4106A goes on sale while EPA finishes its review. "Not approved" is a clock running — not a wall.
"Not on our UL certification."	UL listings are updated by the OEM — it's their choice, not a safety finding. The safety math (worst-case LFL, charge limits) is already satisfied with margin, because R-4106A is less flammable than R-454B.
"Non-code-compliant installation."	Every retrofit refrigerant in SNAP history went into equipment nameplated for something else — R-407C and R-438A into millions of R-22 units. Retrofits never needed the OEM's blessing. A2L-for-A2L, with a higher LFL,

What the OEM letter says	What's actually true
	satisfies the same codes.
"Requires a certified detection system."	Correct — and the detection system certified for R-454B is built for a lower LFL and a faster flame than R-4106A has. The margin improves.
"~9.9 °F temperature glide."	That's a property-table number at constant pressure. On a running system, the CO ₂ pressure drop cancels the composition glide: effective glide is ~0–2 °F, same as R-454B. Put gauges on it — we welcome the test.
"No qualification testing exists."	Because they refuse to do it. A failed test would kill R-4106A overnight — they'd publish it tomorrow. They won't test because they expect it to pass, and a pass collapses the R-454B premium.
"Blends fractionate after leaks."	True of every zeotropic blend, including R-454B and R-410A. Same field rule for all of them: recover, don't top off, recharge with virgin. Nothing new.
"Warranty will be voided."	Their contract, their right. Disclose to the owner and let the owner choose. A warranty position is not a technical finding — don't confuse the two.

The tell is the testing. OEMs run compatibility and reliability programs constantly; testing a refrigerant is routine and cheap. If they believed R-4106A would fail, a published failure would be their kill shot — far more effective than any letter. They have chosen letters over laboratories for one reason: a laboratory result validating a cheaper, better refrigerant resets the price of the gas in their entire installed base. The refusal to test is not caution. It is a forecast.

3. Every Retrofit in History Required Work. This One Doesn't.

Every R-22 alternative EPA ever listed — R-407C, R-407A, R-422D, R-438A, and the rest — made the tech do something: change oil, swap seals, reset controls, manage new glide. And when R-410A replaced R-22, there was no retrofit at all: the whole system got replaced, at the homeowner's expense, because the pressures were 50% higher. That's what refrigerant transitions have cost this industry before.

Refrigerant	Baseline	Discharge ΔP	Discharge Temp Δ	Glide Δ	Oil Change?	OEM Testing Required for SNAP?
R-407C	R-22	+15% to +35%	Varies	+11 °F	Yes (POE)	No
R-438A	R-22	+2% to +5%	Lower	Small	Partial (POE add)	No
R-448A	R-404A	Slightly lower	+18 to +54 °F	+10–11 °F	No	No
R-4106A	R-454B	+2.6% to +2.8%	Comparable	~0–2 °F effective	No	Being requested only for R-4106A

Sources: CoolProp 7.2.0 saturation data (hvacptcharts.com); Purdue IRACC proceedings (R-438A); Tecumseh service guidelines and Honeywell Solstice N40 datasheet (R-448A); FluoroFusion / DEKRA and NIST REFPROP data (R-4106A).

R-4106A asks for nothing and returns more. It carries the smallest changeover burden of any retrofit refrigerant SNAP has ever reviewed — and it's the only one being asked for OEM testing and FMEA studies as a condition.

That standard has never been applied to any refrigerant before it. Ask why it's being applied to the one that undercuts the incumbent's price.

4. The Commercial Reality No One Wants to Say Out Loud

Refrigerant is recurring revenue. The manufacturer whose gas fills the installed base collects on every service call, leak repair, and recharge for fifteen to twenty years per system. A drop-in that outperforms their spec at \$100 less per cylinder threatens that stream whether or not it's safe, whether or not it's greener, whether or not EPA lists it. So the response has been: decline to test, decline to authorize, and write letters about what R-4106A doesn't yet have instead of what it does. None of that is illegal. But it's a commercial position from a party with a commercial interest — not a scientific finding, and not a regulatory judgment. Under the Clean Air Act, that judgment belongs to EPA alone.

And there's a party missing from those letters entirely: the homeowner — who paid sharply more for the A2L system and now pays the incumbent's refrigerant premium on every service call for its life. That premium isn't a law of nature; it's what no competition looks like. R-4106A arrives \$100 per cylinder cheaper, blended in North Carolina, from a reclaim supply chain that gets deeper as the R-410A bank retires. Blocking it doesn't protect the homeowner from anything. It protects the price.

5. Worth Knowing: What's Already Happening

From Texas to South Florida, we keep hearing the same story through our distribution and reclamation network: the R-454B charge comes out of a new residential system, R-410A goes in, and the recovered R-454B ends up charging dry-shipped rooftop units. No lecture here — that's just what happens when the compliant gas is scarce and priced like a luxury while the old gas is cheap and everywhere, in equipment that's essentially the same R-410A machine the trade has run for twenty years, now assembled largely in Mexico and sold at a steeper price. But notice what it means: a GWP 2088 refrigerant is going back into brand-new equipment, and the industry's warning letters were written about a 681-GWP refrigerant that's following EPA's process — not about this. A listed R-4106A at \$100 less per cylinder ends the math that drives the whole thing.

6. Where This Goes From Here

- **For the trade:** field evaluation gas is available now — call us, put it in a system, and verify the numbers yourself. The full data is public: NIST REFPROP cycle analysis, DEKRA ASHRAE 34 testing, the peer-reviewed TFA work. And watch for FluoroFusion's notice that EPA's completeness letter has arrived and the 90-day window has run — that's the green light for full launch.
- **For the OEMs:** test it. Production-grade refrigerant, instrumented testing, third-party witnesses, results published in full — positive or negative. The offer's one condition is that the results go public. That condition is the entire reason it hasn't been accepted.
- **For EPA:** confirm completeness and finish the review on the same standard applied to every prior A2L listing. Every month of delay feeds the R-410A math in Section 5.

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Data as of July 25, 2026. Citations: FluoroFusion SNAP Response (Docket EPA-HQ-OAR-2024-0503); Purdue IRACC paper (July 2026). Full position paper available on request.