

Case Study

Bringing a Next-Generation Refrigerant to Market

How FluoroFusion® Secured ASHRAE R-4106A Approval Without Delays





The Challenge

FluoroFusion Specialty Chemicals is not just developing refrigerants. They are rethinking how refrigerants are created, recovered, and reused.

At the center of that effort is a clear goal: support the development of commercially viable refrigerant solutions

“We’re focused on reducing the carbon footprint of refrigerants,” said Brad Kivlan, COO of FluoroFusion. “Everything we do is about lowering global warming potential and creating a circular system that puts material back to work instead of releasing it into the atmosphere.”

To move a new refrigerant forward, FluoroFusion needed one critical milestone:

ASHRAE Standard 34 approval and assignment of an R-number (R-4106A).

Without it, the refrigerant cannot be referenced, adopted, or commercialized in the market.

And the process is unforgiving.

- Highly specific safety and performance data is required
- Every assumption must hold up under scrutiny
- Any challenge during review can delay progress by months

“If something gets challenged during review, you’re not fixing it next week,” said Bradley Silva of DEKRA. “You’re waiting for the next cycle.”

FluoroFusion needed to get it right the first time.

Why R-4106A Was Developed

R-4106A was not created as just another alternative refrigerant. It was designed to solve a growing problem in the market.

A significant portion of recovered refrigerant returns mixed and difficult to reclaim through traditional processes. At the same time, regulations are pushing for lower global warming potential (GWP), while newer refrigerants often come with higher cost and environmental trade-offs.

FluoroFusion saw an opportunity.

“We’re trying to bridge the gap between legacy high-GWP refrigerants and the next generation,” Kivlan explained.

R-4106A was developed to:

- Utilize mixed and reclaimed refrigerant streams that would otherwise go to waste
- Deliver a solution below regulatory GWP thresholds
- Maintain performance while improving environmental impact
- Support a scalable circular refrigerant model

FluoroFusion positions R-4106A as more than a new product, a step toward a more sustainable refrigerant ecosystem.

Circular Refrigerants: A Different Model

FluoroFusion’s approach is built on circularity.

Instead of relying only on newly manufactured chemicals, their model recovers used refrigerant, reclaims it, and puts it back into use. Every batch contains a percentage of reclaimed material.

According to FluoroFusion, the intended impact includes:

- Designed to reduce demand for new refrigerant production
- Intended to limit emissions from high-GWP gases
- Aims to lower the overall carbon footprint of cooling systems
- Keeps usable material in circulation

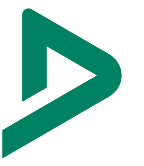
Unlike traditional models where refrigerants are produced, used, and lost, circular refrigerants create a closed-loop system.

This is not just a product innovation. It is a shift in how refrigerants are managed at scale.

The Approach

FluoroFusion partnered with DEKRA to support the full approval process from early validation through final submission and review.





▶ **DEKRA's role was to provide independent testing, validation, and data to support the approval process.**

This was not just about completing required tests. It was about generating data that would withstand scrutiny.

1. Early Validation Before Full Testing

Before committing to full testing, FluoroFusion validated their assumptions early.

“We believed the refrigerant would be [DOT] non-flammable, but we didn't want to rely on assumptions,” Kivlan said.

This reduced risk and avoided costly rework later.

One of the most critical requirements was confirming that R-4106A qualified as DOT non-flammable.

This classification directly affects:

- Transportation requirements
- Storage and handling complexity
- Commercial scalability

DEKRA conducted:

- Flammability limit testing
- Controlled condition validation aligned with DOT criteria

Early collaboration gave FluoroFusion confidence before full testing began.

The result confirmed the refrigerant met DOT non-flammable classification.

That outcome was highly impactful:

- Simplifies logistics and distribution
- Reduces regulatory burden
- Improves commercial viability
- Expands adoption potential

2. Testing Aligned with ASHRAE Requirements

Testing followed established ASHRAE standards and methodologies required for classification and approval.

This ensured the data:

- Met defined regulatory expectations
- Reflected required safety and performance criteria
- Could withstand detailed technical review

3. End-to-End Execution

DEKRA supported the entire process, including:

- Flammability and burning velocity testing
- Fractionation modeling and validation
- Properties and Toxicology assessments
- Application preparation and submission
- Representation during ASHRAE review

FluoroFusion worked with a single partner across testing, documentation, and defense.

The Outcome

FluoroFusion successfully received an ASHRAE designation: R-4106A.

This milestone:

- Establishes the refrigerant as a recognized industry standard
- Enables commercialization and market adoption
- Supports further regulatory approvals, including EPA SNAP

“It's a critical step. That R-number is how the market refers to the refrigerant,” Kivlan said.

Just as important, the approval was achieved without delays, rework, or resubmission cycles.

Client Perspective on Sustainability

Traditional refrigerants can have GWP values in the thousands.

According to FluoroFusion, the circular approach is designed to reduce impact by:

- Reusing existing refrigerants instead of producing new ones
- Lowering the net carbon footprint of each batch
- Limiting emissions from leaks and disposal

Refrigerants can also be recovered and reused repeatedly without losing core performance.



That creates a long-term advantage:

- Less waste
- Lower emissions
- Reduced dependence on new chemical production

Why It Worked

FluoroFusion's success came down to a few key decisions:

- Validating assumptions early
- Aligning testing with regulatory requirements
- Generating defensible, high-quality data
- Partnering with a team that could execute end-to-end

"We can rely on DEKRA to handle critical parts of the process without having to worry about them," Kivlan said.

Looking Ahead

FluoroFusion is continuing to develop low-GWP refrigerants built on circularity and environmental performance.

"We want to reduce carbon in the atmosphere. That's the mission," Kivlan said.

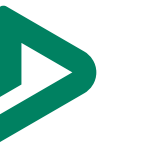
With R-4106A approved, they now have a clear path forward.

What This Means for Other Teams

If you are developing a new refrigerant or preparing for ASHRAE submission:

- The biggest risks happen before testing is complete
- Assumptions must be validated early
- Testing must align with regulatory requirements
- Data must hold up under scrutiny

Because once you reach committee review, there is no room for gaps.



Set Your Submission Up for Success

From early validation through final review, DEKRA supports the testing and data needed to keep your approval process on track.

[Get the data and validation you need to move your submission forward.](#)

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