

# Aquaset™ Resins



## Improved Home Insulation:

The Story Behind  
Rohm and Haas' Advanced  
Acrylic Thermosetting  
Technology

**ROHM AND HAAS** 





# Aquaset™ Technology:

## What it Means for Reduced Energy Waste, Safer Workplace Conditions and Pleasant Living Environments

As the country's largest landlord, the United States government is uniquely situated to spark building trends, and since the early 1990s, it has spearheaded the green building movement. From the White House to the Pentagon to national parks like Yellowstone and the Grand Canyon, federal facilities are boasting environmentally advanced technologies like photovoltaic cells, double-paned windows, planted roofs and water recycling systems. Now firmly entrenched in the private sector, green building continues to gain ground. This healthy trend is rapidly fomenting planet-friendly innovation in a construction industry worth about 20 percent of our nation's economy – in 2007 alone, experts expect the value of green building products and services to exceed \$12 billion.

For decades, Rohm and Haas has led the chemical industry in developing environmentally advanced products and sustainable technologies that deliver superb performance at costs that equal or beat traditional competing choices. Its forward-thinking innovations on a worldwide basis have removed solvents from indoor and outdoor paints, spearheaded water-based industrial adhesive use, and more.

### Revolutionary Aquaset™ Technology

Rohm and Haas now supplements its offerings for the construction industry with a revolutionary acrylic chemistry platform called Aquaset™ thermosetting resin technology. Aquaset resins enable manufacturers to produce high-quality, cost-effective building insulation made without formaldehyde. Until now, there hasn't been an environmentally smart alternative to formaldehyde resins for binding fiberglass fibers in insulation. But with insulation a \$3 billion business yearly in the United States alone and expected to approach \$23

billion globally by 2009, Aquaset resins are gaining keen attention and traction in a marketplace hungry for high performance building materials that are environmentally advanced.

The advantages of these thermosetting resins for insulation are many and the technology supports an extremely robust green building trend that is growing strongly. It aids insulation manufacturing facilities, their workers and insulation installers seeking safer working conditions. It also helps address indoor air quality issues that may arise or worsen as building envelopes tighten and air circulation decreases. With Aquaset resins, manufacturers and builders also proactively respond to the increasing scrutiny governments and other entities, wary of possible health effects, are directing at formaldehyde.

### Green Building: It's Growing

Green building isn't new. Early 20th century keynote structures like the Flatiron building in New York City, for example, featured ideas such as deeply set windows to manage heat gain. Today, even commonplace structures incorporate methods designed to use energy, resources and materials more efficiently, and in turn, lessen environmental impact while improving economic performance, human health and productivity.

Green building often utilizes multiple advanced features. Builders may consider land use, situating structures to capture maximum sunlight for photovoltaic cells. They may install systems that capture waste heat to provide hot water for occupants. Interior materials often are selected for minimum volatile organic compound (VOC) emissions in addition to maximum recycled content and future recyclability. Community sustainability enters the

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## For Wal-Mart Building Green Makes Dollars and Sense

Building green makes dollars and sense – a surprise to builders and homeowners who expect building costs to balloon. The truth is that green techniques typically add between two to seven percent to building costs initially but often recoup investment within three to five years since energy costs are up to 20 to 50 percent less than traditional buildings. And green buildings pay dividends for decades: operating cost savings last throughout the structure’s life cycle.

Further, people benefit, in turn ringing up substantial monetary profits for companies and employers. When Wal-Mart installed natural lighting in its Lawrence, Kansas store, sales rose significantly, and the firm immediately specified natural lighting in all new stores. Subsequent studies have pegged sales increases of up to 40 percent in stores with skylights. When Lockheed debuted its green office place in Sunnyvale, California, absenteeism fell 15 percent – neatly offsetting the extra upfront building costs in the first year. Green building isn’t just a feel good strategy – it directly translates into greater personal and business assets.

equation, too: progressive residential developers are setting aside open space, and preserving native ecosystems as part of residential development.

Statistics support the need and logic for building green. As Americans, we each contribute 50,000 pounds of carbon dioxide to our atmosphere annually, with most of that coming from our houses. The U.S. Department of Energy finds that heating and cooling comprise 50 to 70 percent of a home’s energy use. A worldwide review strengthens the case: the “build” environment accounts for one-third of water, energy and materials use worldwide, with 25 percent of global energy demand emanating from residential property.

### Insulation: An Important Key to Reducing Energy Use

High quality, properly installed insulation is key to realizing green building results. Proper insulation like that produced with Aquaset binders often reduces energy bills 30 to 40 percent over homes with deficient materials and installation, reducing greenhouse gas emissions while boosting occupant comfort. Experts also say that installing additional insulation – even in relatively well-insulated homes – is one of the simplest, quickest ways to further lower energy costs.

Insulation with Aquaset resins may boost living conditions in other ways: by improving indoor air quality. As homes and buildings become progressively “tighter” with less air exchange, indoor air quality suffers. The

U.S. Environmental Protection Agency (EPA) finds that indoor levels of many pollutants can be 25 times and occasionally up to 100 times those levels found outside –

## Traditional insulation can contribute to odors and indoor air quality issues

as we spend more than 90 percent of our time indoors this may be a cause for concern. Poor indoor air quality has been implicated in health problems like irritation, headache, nausea, asthma, allergies and more serious long-term disorders. Experts estimate that improving indoor air quality would save between \$23 and \$56 billion due to better health and increased productivity.

If traditional insulation may contribute to odor and



indoor quality issues, insulation made with Aquaset technology offers a perfect alternative: an economical, high-performance choice for producing insulation made without formaldehyde.

### **Aquaset Technology: OSHA's Highest Safety Rating**

During insulation manufacture, filaments of fiberglass are spun from molten sand then bound together with sprayed-on resins that lock the filaments into a stiff, fluffy batt. Effective binders are crucial. Batts are compressed during packaging; stiffness springs batts

## **Aquaset technology was awarded the 2006 Heroes in Chemistry Award**

back to original size when they're unwrapped, enabling them to trap still air within the open structure of the filaments, reduce air leakage and slow heat transfer.

More than 10 years ago, Rohm and Haas anticipated a market need for an environmentally advanced insulation binder. Formaldehyde-free Aquaset binders hit the market in 2002 with an outstanding list of pluses carefully designed by Rohm and Haas' chemists.

The chemistry of Aquaset technology is a sustainable one that is non-combustible, non-hazardous, non-reactive, recyclable and non-flammable – characteristics earning it the very best 1-0-0

safety rating awarded by the Occupational Health and Safety Administration. The influential American Chemical Society praised it also, awarding Aquaset technology the 2006 Heroes in Chemistry Award, an important recognition for scientists and companies that improve human welfare through commercial innovations and products. Most important, this technology yields exceptional insulation whose performance is indistinguishable from competing choices (see sidebar).

### **Aquaset Resins: Saving Energy while Improving Workplace Conditions**

While Aquaset binders use requires adjustments to plant equipment, manufacturing environments and processes improve, insulation manufacture utilizing Aquaset binders drastically reduces or even eliminates exposure to fumes and volatile organic compounds. "Our curing process produces only water and virtually eliminates harmful gas emissions," says Timothy Wood, Rohm and Haas technology director, Industrial and Construction. "Traditional binders, on the other hand, emit compounds like formaldehyde, methanol,

phenol and ammonia during cure and can continue to emit formaldehyde through shipping, storage, installation and home occupation as well."

Using Aquaset technology also eliminates the energy, cost and equipment for handling emissions from traditional binders. Insulation facilities that use Aquaset technology are no longer required to use thermal oxidizers that generate the greenhouse gas carbon dioxide and nitrogen

## **It's in the Batt: Aquaset™ Binders Produce Superior Insulation**

Insulation produced with Aquaset binders meets and exceeds all applicable technical standards under the American Society for Testing and Materials standard C 665 for mineral fiber blanket thermal insulation, as well as requirements administered by the International Code Council. Appropriate for new or replacement installations, it shows superior ability to resist sagging and deterioration over the long-term, even in challenging high humidity conditions. Similar R-values – an objective measurement of insulation's ability to insulate – to competing choices make building specifications easier and occupants comfortable. Its compressibility, moldability and recovery are comparable to, and in some cases better than, insulation produced with formaldehyde, as is its finished weight – a crucial consideration as shipping accounts for one-third of insulation's cost.

### **What's Next: Building the Aquaset Portfolio**

Aquaset resin properties improve products besides building insulation. The technology is used to bond other glass-based non-woven and polyester materials that may find applications in roofing, flooring, ceiling and acoustical tiles. Aquaset resins also bind oven insulation – a component of the appliance that protects surrounding kitchen areas from high oven temperatures. "Formaldehyde-containing oven insulations can, particularly during self-cleaning cycles, emit formaldehyde, causing fumes and perhaps indoor air quality issues – problems that Aquaset bound insulation circumvents," notes Hal Morris, global sales and technical service manager for Aquaset technology.

Rohm and Haas continues to extend Aquaset thermosetting resins' capabilities and reach, both geographically and technically. "This is a major, very promising technology platform, and we're investing very heavily in its success," Morris comments.

## Regulators Eye Formaldehyde Cautiously

While controversy still surrounds formaldehyde's use, regulators are increasing scrutiny and strengthening rulings on the substance here and abroad. As far back as 1981, the National Institute for Occupational Health and Safety advocated handling formaldehyde as a potential occupational carcinogen. The U.S. National Toxicology Program proposed that formaldehyde be known as a human carcinogen recently, while the EPA advised limiting exposure to what they labeled a probable human carcinogen. States have begun to track its use at a more local level: the California EPA Air Resources Board recommended formaldehyde-free building materials after classifying it as a Toxic Air Contaminant.

Internationally, a cursory survey reveals that formaldehyde is under strict review. The International Agency for Research on Cancer classified it as a known human carcinogen in 2004. Countries have taken a deep breath over the news: Japan now lists the substance as one of two chemicals requiring tracking under its "sick house" regulation. Formaldehyde features prominently in "substances of concern" under the European Union's Registration, Evaluation and Authorization of Chemicals (REACH) legislation. Industry watchers predict that companies doing business in Europe will substitute other chemicals for formaldehyde – a business-savvy method for complying with the letter and intent of REACH. Others point out that public concern over chemical substances that first arises in Europe frequently crosses the Atlantic over time.

oxides – precursors to ozone that have been implicated in acid rain. Auxiliary chemicals such as urea, used to control formaldehyde during manufacture, are unnecessary. Production lines run at the same or higher speed with Aquaset resins as with other choices and produce fewer particulates in the work environment. Unlike formaldehyde resins, Aquaset resins don't require refrigeration and remain stable at room temperature. During production, the product is diluted with an abundant, completely benign substance: water.

Handling is simplified, too. Unlike traditional choices, Aquaset binders require no special personal protective measures, handling, storage or transport. For shippers, retailers and installers, fumes and possible chemical exposures are nuisances of the past.

### Adoption Reaps Regulatory and Consumer Kudos

Major North American insulation manufacturers can experience all these positives first-hand. After adopting the Aquaset technology process, one manufacturer became the only producer in the United States exempted from the EPA's National Emission Standards for Hazardous Air Pollutants for Wool Fiberglass Manufacturing. In other clean air news, the company reduced plant formaldehyde emissions by more than 200,000 pounds, ammonia by more than one million pounds, and eliminated phenol and methanol emissions completely. Canada has taken note: the new insulation became the only bonded fiberglass insulation eligible for Environment Canada's



prestigious Environmental Choice EcoLogo Program.

Further, consumers, builders and architects are beginning to demand these next-generation insulation products. The clean look the innovation lends attracts attention, though the fluffy white appearance of the batts is, of course, secondary to what consumers directly request: nearly 85 percent say they want formaldehyde-free insulation. Builders are listening: 64 percent of them use it regularly and that number is rising quickly.

### Choosing the Environmentally Advanced Alternative

As with many substances important to industry, formaldehyde may be necessary in some applications



as well as familiar to companies that specify the chemical in their processes. Likely, formaldehyde has a place in a modern industrialized society. Savvy companies and knowledgeable consumers, however, may decide it's prudent to adopt advanced technologies like Aquaset resins that provide environmentally advanced replacements that perform equally well in products.

"We believe we'll see a tipping point similar to what we experienced with paints," says Raj Gupta, Rohm and Haas chairman, president and CEO. "First, just a few paints became water-based, then the water-based trend grew until now solvent-borne paints are used only for very special circumstances. We're on the forefront of facilitating the introduction of formaldehyde-free insulation products, and if we talk in 10 years, I believe we'll

be discussing the same kind of wholesale conversion with insulation and other building products."

Aquaset technology's future looks very bright – a characteristic echoed by the bright, white insulation batts that identify its use. With its presence spreading from building insulation to oven insulation, roofing and beyond, it's a modern technology that is helping a fast-paced building industry grow.

## How America is Building Green

Commercially, residentially, scholastically, we're heeding the need for green. About \$10 billion worth of "green buildings" were under construction during

2006. The National Association of Home Builders, whose members build four of every five homes in America, estimates that more than half of its members expect to employ "green" practices by year's end. Significantly, green also has become an important selling point for buyers, often negating the impact of associated cost increases. Even the youngest benefit as studies confirm that greening schools increases student performance and health while decreasing operational costs. It's no wonder that National Public Radio predicts a five-fold increase in green building starts by 2010. ▼

## Rohm and Haas Scientists: Heroes in Chemistry

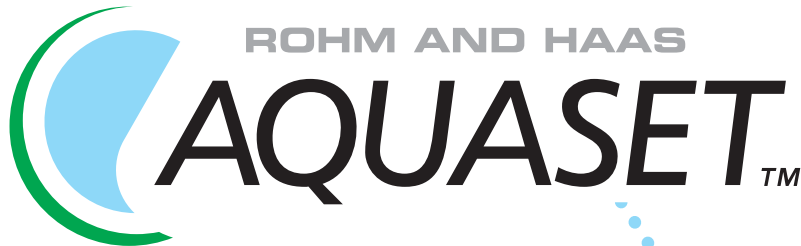
Chemists may not enjoy an athlete's or entertainer's high public profile, but their contributions are arguably more significant. With its annual Heroes in Chemistry awards, the American Chemical Society shines a well-deserved spotlight on a different group of stars: scientists whose work has changed our society for the better.

The award honors talent, creativity, energy and innovation in chemistry and chemical engineering that lead to commercially successful advances that don't just improve our lives, but refresh and expand the definition of what our future can be. Past honorees have introduced a range of beneficial technologies. Their contributions range from synthesizing the first drug in an entirely new class of antibiotics to developing a method for making smaller microprocessors to inventing a process for reducing gasoline's sulfur content – a compound that adversely affects air and water quality.

When Rohm and Haas' team won the 2006 Heroes in Chemistry award for Aquaset technology, the award didn't just single out a noteworthy achievement by a group of talented individuals. It also highlighted a company culture dedicated to seeking out and retaining the most disciplined, educated and inquisitive chemistry minds in the business. As it continues to introduce innovations into lightning-paced, demanding marketplaces, Rohm and Haas' culture, investment, collaboration, research and development make advances like Aquaset technology not just possible, but probable.

NEW

# Advanced Binder Technology from Rohm and Haas

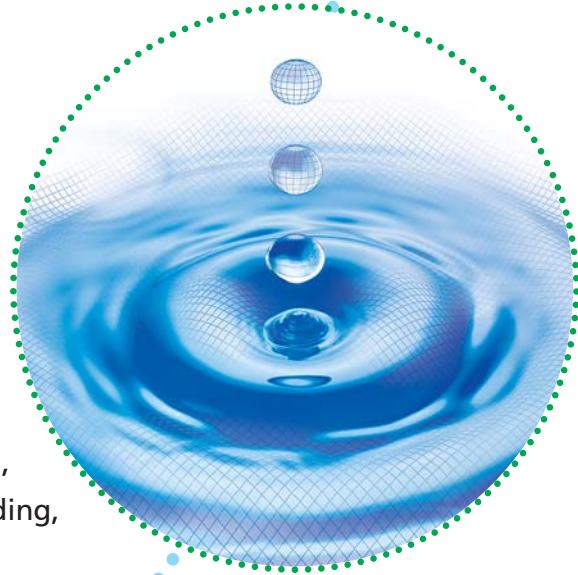


Rohm and Haas, global leaders in pure acrylic chemistry, has developed a new range of high-performance acrylic thermoset binders, patented under the tradename Aquaset™. This new technology is based on aqueous resins and offers an environmentally-advanced, safe alternative to traditional formaldehyde-based thermosets.

The benefits are compelling:

- Less toxic chemistry
- Ultra-low emissions of pollutants
- Low odour

Aquaset™ binders also offer **excellent durability, moldability** and are **non-yellowing**, making them an excellent choice for the building, automotive and furniture industries.



To find out more about Rohm and Haas Aquaset™, contact Johnny U at [johnnyu@rohmmaas.com](mailto:johnnyu@rohmmaas.com) or your local Rohm and Haas account manager.



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