



Center for  
Quick Response  
Manufacturing

UNIVERSITY OF WISCONSIN-MADISON

# QRM PROFILES

## QRM Empowers RenewAire to Become Industry Leader



*The QRM Center is a university-industry partnership dedicated to improving manufacturing competitiveness through research and implementation of lead time reduction principles.*

# RenewAire's QRM Successes Reduce Lead Time, Expand Product Options, Grow Market Share

by Kathleen Watson

For some entrepreneurs, launching a business is more than simply a means to generate income and build equity. Entrepreneurism enables them to meld their worldview and value system with their financial pursuits.

Chuck Gates was living his values in 1978 when he entered the field of energy conservation by founding Solar Specialists, a firm that installed solar systems and wind generators to produce electricity. His company's name and ownership evolved as it expanded its product mix.

By 1994, he decided to narrow his focus to indoor air quality. His business enterprise became RenewAire in 2000, a firm with a mission of maximizing energy conservation while providing healthier indoor environments. Its products, energy-recovery ventilation units, or ERVs, are integrated into residential heating and cooling as well as commercial HVAC systems to improve air quality in homes, schools, offices, factories, hospitals — anywhere people live, work and breathe.

## **Growth, product variety, unpredictable demand challenge status quo**

RenewAire started as a small player in the field of ERV manufacturers, but an expanding market and the company's product quality and multiple options contributed to its steady growth. By 2002, there were 160,000 RenewAire ERVs installed across the country.

Gates welcomed the growth, but he began to worry about the way forward. How could a relatively small company continue to compete and survive among large, well-established competitors? How could RenewAire keep its product mix diversified to meet a variety of needs without runaway costs and extended delivery times?

RenewAire faced all the usual problems that can come with both growth and unpredictable demand: hot jobs and the delays they created for other orders, ballooning lead times, too much WIP, customer complaints about delivery times.

"Our systems were overloaded," Gates recalls. "We had a batching



### **Company Profile**

Founded 1978 Madison, Wis.  
Privately held  
Headquarters & Production  
April 2017: moved to  
new 111,000 s.f. facility  
in Waunakee, Wis.  
100 employees / 1 shift

### **Products**

Commercial & Residential  
Energy-Recovery Ventilators  
(ERVs)

### **Primary ventilation/ HVAC Markets Served**

Commercial  
Institutional  
Residential

**[www.renewaire.com](http://www.renewaire.com)**

mentality and long production lines with supervisors holding stopwatches timing everything. We were incorporating Lean principles, but I could not envision Lean as a complete remedy to our problems."

He recognized that the pressures brought by success were feeding internal tension: "We lacked cohesion; there was no sense of team or shared goals. Everyone was unhappy, and an us-versus-them

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*Cover, bottom: Proud and happy RenewAire book-club graduates celebrate their achievement. The clubs help train new hires, keep QRM top-of-mind, and ensure ongoing understanding and support for QRM's principles and processes. Above, operator wires a commercial ERV (top left) and ERVs travel among shop-floor cells (top right).*



*Chuck Gates, CEO*

mentality prevailed. Sales staff were simply trying to meet customers' needs for variability, and production staff did not always welcome how those needs complicated their jobs."

"I feared that our success would choke us and cause our customers to go elsewhere," Gates admits. But he didn't know where to turn; he didn't have a vision, much less a plan, to remedy the negative aspects of RenewAire's success.

A ray of hope struck Gates in late 2002 when he saw local newspaper coverage of an upcoming conference to be presented by the University of Wisconsin-Madison Center for Quick Response Manufacturing. Intrigued, he registered, attended the two-day conference, and came away full of inspiration — and a vision of a positive way forward for his company.

"QRM is a unifying strategy; the singular focus on time brings people together," the now-QRM veteran explains. "It helps align a company's goals with its customers' needs."

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### **Education and training create path to change**

Gates sensed right away that QRM would be a good fit for RenewAire's multiple product options, numbers of units produced, and the need to make them better and faster than its competitors. But it was going to involve a massive change in attitude, in organizational structure, and in practices.

Changing mindsets was the first step, and Gates knew that would require education and training. He shut down the entire RenewAire operation for a half-day at the end of 2002 and had UW-Madison Professor Emeritus Rajan Suri, QRM's founder, provide an overview for all employees. Suri explained what QRM was, how it worked, and the benefits it could yield for RenewAire.

After the half-day overview, those in leadership positions participated in an additional intense two-day Introduction to QRM off-site workshop.

### **Implementation: Where to begin?**

Narrowing the scope of initial QRM implementation to a particular product or market segment allows for testing its principles as well as evaluating and fine-tuning the transition process before broader application.

Residential market products, then 45% and now 25% of the

company's dollar volume, were smaller, assembling them followed similar processes, and some could be made to stock.

Commercial market products, then 55% and now 75% of the company's dollar volume, were larger and had tremendous variability and make-to-order custom potential.

The distinctions made the Focused Target Market Segment (FTMS) separation obvious: RenewAire formed two teams — one residential and one commercial — based on product and assembly differences for each.

### **QRM cell concept begins on production floor**

"Our commercial production occupied a large amount of floor space with many discrete operations," Gates recalls. "We marked the floor with tape to designate cells, and we limited how many jobs we would allow to be worked on at a time.

"If we had an order for 35 ERVs for a school, for example, we completed just one or two at a time. Much to our surprise but consistent with QRM philosophy, we discovered that we could drop in a small, high-priority order without affecting the overall delivery time for the large order. We gained scheduling flexibility without compromising efficiency."





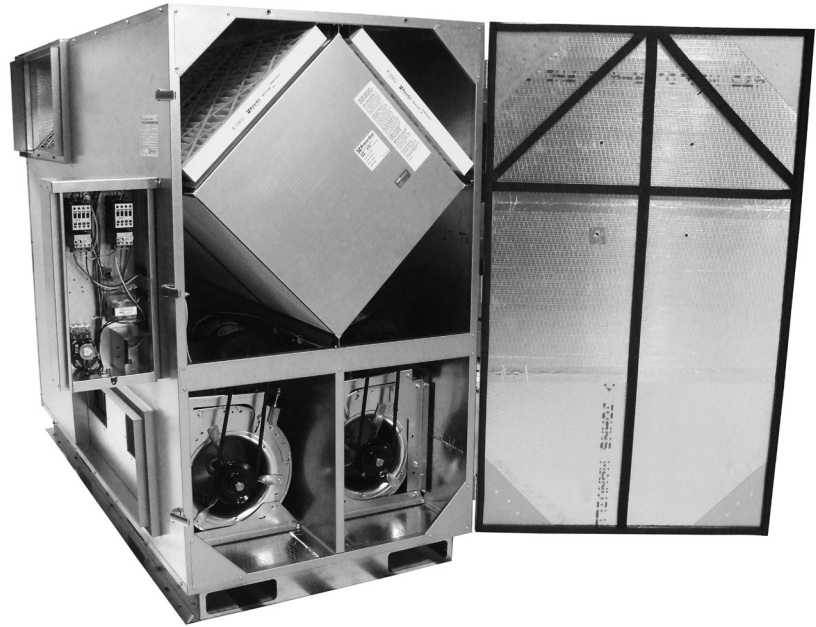
*Residential ERVs can be as small as 2 feet wide by 2 feet high and a foot deep. This model weighs just 36 pounds.*

Even with a separate residential and commercial FTMS team, the new QRM focus on the big picture rather than on departmental goals helped eliminate what had been a shop floor/desk job differentiation; integration and success became everyone's responsibility.

### **Residential Team defines duties**

Members of the Residential Team's new duties encompassed:

- integrating with sales team: receive orders after entered into system; acknowledge orders; determine ship date and advise customers
- self-managing production: schedule work; write manufacturing and quality procedures; maintain and repair equipment
- integrating materials: decide location and receive, organize, store and monitor selected materials and parts
- integrating with shipping: prepare and stage completed ERVs and arrange for shipping



*This commercial ERV is on the smaller end of the size range, which can be from 4.5 to 9.25 feet wide, 2 to 17 feet deep, and 3 to 6 feet high. Units can weigh from 200 to 4000 pounds, depending on their size and number of options.*

### **Commercial Team sets new work guidelines**

The Commercial Team's challenges and steps were a bit different. Product variability was extensive — 25,000 potential configurations at that time, and more than double that now. Batch sizes were large and unpredictable, and build procedures were unclear. WIP choked the production floor, and shortages in tools and equipment contributed to work slowdowns.

The Commercial Team adopted a practice of cutting production lot size to 1–4 units with NO exceptions. Other changes expanded their focus and capabilities to:

- setting own short-term schedule for 1–4 upcoming days

- reducing routings to a single step for entire assembly process
- developing materials-storage practices
- ensuring availability of and maintaining tools and equipment
- cross-training team members in over 200 skills
- updating manufacturing and quality procedures

By establishing smaller lot sizes and honoring the agreement to never start a designated number of units that can't be finished that day, WIP practically disappeared.

It didn't take long for the changes to yield improvements in both residential and commercial production. "We started to see

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— Chuck Gates

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results by the end of the first month,” Gates says. “Quality began to rise, production costs and lead times were dropping, and customer satisfaction was growing.”

### **Student teams provide analysis, recommendations**

To support continuous improvement, Gates has brought in a number of QRM Center-affiliated student teams. He credits their insightful analysis and spot-on recommendations with providing great benefit in establishing QRM at RenewAire, especially in the early stages when the concepts were new and untested.

“Our first project was a redesign of our residential assembly line, which opened our eyes to possibilities we might not have seen had we simply attempted it on our own,” Gates says. “As we learned and became more sophisticated, so did the projects and outcomes.”

He adds, “One memorable project was redesigning our Light Commercial Cell to reduce lead times and increase capacity, while at the same time addressing increased product complexity. When the students finished their conceptual work, we hired one of them to work



*Cross-trained technicians wire and mount motors and blowers.*

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“We had done a really good job early on with the manufacturing part of QRM, but we had no formal program for orienting new workers and no continuing education for current staff. In that void, even those committed to QRM lost some focus.” — Chuck Gates

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with a manufacturing engineer and production technicians to implement the project over the summer.”

### **Budget includes continuous improvement hours**

Along the way, Gates adopted the immutable principle that regardless of the workload, production technicians have two primary day-to-day responsibilities: The first is direct production (shop-floor assembly), and the second is manufacturing improvement (boost efficiency and reduce lead times).

To create time for continuous improvement and how it is accounted for, Gates explains:

“As part of our annual budget cycle, 15% of anticipated direct-labor hours are added to overhead to specifically support continuous improvement and other non-production value-added activities.

This also creates a pool of variable excess capacity that can be used when there is a spike in demand.

“When demand drops, more hours than those budgeted can be used for focusing on improvements. The daily labor tracking system directs the hours and costs to the right allocations.”

Technicians know to record time spent on specific jobs for producing products and to separately record as “perpetual/non-closing” the improvement jobs that allocate the costs to overhead.

After 12 years of QRM, RenewAire was humming in 2014, riding a wave of steady growth and profitability. At the same time, Gates recognized that the ERV market was maturing and becoming more competitive, attracting more and similar manufacturers. In the QRM spirit of continuous improvement, Gates sensed a need to take a step back and reassess.

### **QRM beyond the shop floor: book clubs**

“We had done a really good job early on with the manufacturing part of QRM, but we had no formal program for orienting new workers and no continuing education for current staff. In that void, even those committed to QRM lost some focus.”



*With QRM, technicians start and complete a full unit build in one cell.*

## Forest Brings Education and Experience; Ascends to Presidency in May 2018

When RenewAire drifted into the doldrums in 2014, a stroke of luck was just around the corner. Scott Forest, a retired Air Force Colonel with an MBA and a bachelor's in aeronautical/astronautical engineering, crossed paths with Chuck Gates at a QRM Center event. Forest not only had manufacturing experience in a QRM setting; he had earned a Black Belt in Lean Six Sigma, and he had fulfilled the Tempus Institute's requirements for Level II: QRM Leadership certification.

Forest came on board in mid-2015 and hit the ground running. As vice president of operations and continuous improvement, he took over the company's entire QRM training curriculum.

"He arrived with an understanding of the principles and application of QRM," says Gates, "which helped us renew our focus and revitalize our training programs. He fine-tuned our QRM Book Club, he developed the new MCT Mapping Book Club, and he became involved in all of our continuous-improvement efforts."

There now are two knowledgeable, certified and committed QRM advocates in leadership positions to help educate employees and nurture a QRM culture companywide.

Forest and Gates share a philosophy about the power of people. "Few businesses maximize the potential of their workforce," Forest says. "Untapped intelligence, creativity and teamwork represent missed opportunities. Our employees' skills and enthusiasm power our growth and profitability.



*Scott Forest, President*

QRM is fundamentally a people-centric manufacturing methodology."

RenewAire boasts a post-QRM-training employee turnover rate of less than 5%.

Forest also works with the RenewAire Supply Chain Team and vendors, helping them learn to adapt to RenewAire's changing needs.

"Vendors who embrace variability and can commit to short lead times are a good fit for us. We might be a little more challenging to work with, but vendors see our growth, and they want to be a part of it," Forest says.

"They make it clear they don't want to lose us as a customer, and we make clear what our needs and expectations are," he adds. "We encourage them to look at their own continuous-improvement efforts, and for some of them, QRM becomes their way to create a path to their own growth."

Gates also realized that despite RenewAire's vast QRM implementation and improvements, the transition was not truly company-wide. "Our successes had been largely production achievements," he says. "We needed to build on our successes by expanding QRM throughout our organization."

Gates again consulted with Suri, who repeated an off-site, daylong, companywide training to refresh the long-timers and help introduce QRM to newer hires. "Treating QRM training as important enough to pull people off the job conveys management's commitment and creates a fresh learning environment," Gates says.

To ensure continued support for QRM and keep it relevant and top-of-mind, Gates communicated with another company using QRM that had established a book club, an ongoing program that puts education at the forefront of nurturing QRM practices and continuous improvement. Using that firm's educational approach as a prototype, RenewAire's president, Scott Forest, adapted it for the company's product and processes. Participation in the club is voluntary and includes staff from production, sales and administration.

RenewAire provides books — Suri's *It's About Time: The Competitive Advantage of Quick Response Manufacturing* — and assigns chapters accompanied by a study guide to prepare 12–17 readers at a time for group discussions. Participants meet during the workday for seven weekly sessions, each lasting from 75–90 minutes. A celebration with a special lunch and graduation ceremony marks each group's accomplishments.



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## “Don’t compete on price; beat your competition to the sale.” — Chuck Gates

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Ninety percent of all employees have taken part, welcoming the opportunity for professional development. As they expand their knowledge base, they are contributing to RenewAire’s success — and to their job security.

“The book clubs have become our cornerstone,” Gates says. “We will continue to update the curriculum and encourage group participation to ensure that the vast majority of our employees are trained in QRM.”

An internal team has even developed a hybrid product-development system, trademarked as QPD (Quick Product Development), by blending the best of QRM and Lean to create a high-velocity process. Innovation is key to remaining an industry leader, and QRM principles can improve the speed of bringing new products to market.



*Technicians perform and record full-function testing of each unit they assemble, a standard practice at RenewAire.*

### **Growth forces move to new, larger facility**

Although there has been little capital investment needed to support the QRM transition and ongoing practices, business growth has made additional space necessary.

RenewAire moved to a new building in spring 2017. The layout accommodates current needs and provides the flexibility to adapt and expand for even more growth, a likely prospect for this thriving company. “QRM has been designed into the DNA of the shop floor and the office,” Gates says, and this sustainability advocate adds, “It will also qualify for LEED Gold certification.”\*

RenewAire’s relentless continuous-improvement journey marches on. “As a macro trend, everyone wants more variety, more customization, more choices, and they want their product in a shorter time,” Gates observes. “Our market, too, values product variety, which we have increased over time. QRM allows us to expand our choices, yet meet delivery expectations.”

RenewAire has enjoyed consistent growth and profitability despite a fluctuating economy and market conditions. It now has 18 residential models with 40 optional

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*\* Leadership in Energy and Environmental Design, a rating system that measures the design, construction and operation of buildings, homes and neighborhoods that achieve high performance in areas of human and environmental health.*

### **Results**

14 years of QRM focus have yielded dramatic drop in total lead times:

- Residential ERVs: 10 days to 2 (80% reduction)
- Commercial ERVs: 25 days to 12 (56% reduction)
- Number of Employees: 108% growth
- Market share increase more than doubled: 130% +
- Revenue Growth: 254% +
- Despite 50% growth rate over past 2 years, RenewAire still tops in industry for customer responsiveness; lead times half of those of competitors

### **2017 Accomplishments**

- Moved into new 110,000-square-foot building (2.5 X larger than previous)
- Introduced wired, Wi-Fi, and Bluetooth-enabled internet connections and controls to commercial product line
- Grew again by 11%, resulting in 67% growth over past three years (2015-2017)
- Continued QRM education program by conducting five more book clubs
- Achieved lead time reductions despite continued growth and moving pains, repeating historic, industry-leading norms
- Despite 2.1% unemployment in Dane County, QRM culture helped recruit, train, grow staffing 20%

accessories. Commercial products are classified into a dozen product families with over 50,000 options.

Business was up 25% again for 2016, and overhead held steady at 8% of revenue. Labor costs have dropped 20%, while pay and benefits have risen 60% over the past 10 years. Turnover post-QRM training remains at 5%.

And everyone continues to be amazed that there is always less than one day of WIP on the shop floor at any given time.

Gates has learned a valuable business lesson: “Don’t compete on price; beat your competition to the sale.”

“QRM makes that possible,” he confirms. “It offers a clear, shared vision that unifies people. It has made a vast improvement in our company culture, because everyone is included; everyone plays a part in our success.”

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*Designed with QRM principles in mind, RenewAire’s new facility reduces energy use and creates a healthy indoor environment and a positive, people-centric workplace.*

### Key Lessons from RenewAire’s QRM Journey

- QRM is a marathon, not a sprint.
- Long-term commitment to QRM requires periodic maintenance and upgrades.
- Companywide emphasis and participation are critical.
- A limited employee knowledge base limits a company’s growth.
- The importance of education cannot be overestimated: Show the benefits and possibilities of QRM, and empower people to achieve results.
- Effective change starts and continues with grassroots efforts.
- Successes motivate action.
- It’s all about the people — always.



## Center for Quick Response Manufacturing (QRM)

Established in 1993, the Center for Quick Response Manufacturing at the University of Wisconsin-Madison is a partnership between industry, faculty and students dedicated to the development and implementation of lead time reduction principles.

For over two decades, the QRM Center has helped more than 200 companies of varying sizes from a wide array of industries reduce lead times in all aspects of their operations and become more competitive in the global marketplace. The Center can point to an impressive track record, with several member companies realizing lead time reductions exceeding 80%, cost reductions of up to 30%, and on-time delivery improvements of over 99%.



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