

Implementing Performance Improvement using a Baldrige based Criteria at Wathen-Castanos Hybrid Homes: A Case Study

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Often the perception in the homebuilding industry is that the implementation of quality management is difficult, excessively protracted and has limited impact. Especially now, during a recession, how could you devote time to such an implementation when what you need to do is to keep your head down and stay focused on everyday work to survive? Mike Nimon, president of Wathen-Castanos Hybrid Homes, Inc. (WCHH), based in Fresno, California, had a different view. In one of the toughest markets in the United States, he believed that this was a time for taking stock, taking a fresh perspective, and studying the market and other opportunities for improvement. This included introducing green and energy efficient building practices and integrating them

with quality management to drive efficiencies and, in that way, move the business forward, and doing so with limited resources.

The IBACOS and Business Excellence Consulting (BEC) team worked with WCHH from mid-2009 to the end of 2010, training, implementing, and supporting quality management and high performance home building techniques. The Baldrige-based National Housing Quality Award (NHQA), the Energy Value Housing Award (EVHA), and the U.S. Department of Energy's Builders Challenge were used as drivers for change. At the end of 2010, WCHH had won the NHQA Bronze and EVHA Builder of the Year awards and had improved in every category of the NHQA Self-Assessment. WCHH continued on to win the NHQA Silver award for 2011. The journey continues, which, of course, is the whole point.

The Approach for Quality Implementation

Despite being in what was referred to as a ravaged and foreclosure impacted marketplace, WCHH president Mike Nimon saw a continued focus on improving the green and energy efficient performance of his company's homes and using quality management to create organizational improvement as the way forward for the business. In 2009 with a small team of 28 employees building 194 homes per year, increasing operational efficiency was the focus. However, in such a tough economy, there was a need to achieve this with minimal resources.

The often cited barriers to implementing quality include cost, the perception that such implementation will take a long time, that it is difficult, that significant organizational infrastructure changes will be necessary, and that the impacts are limited. To begin the introduction of quality management, the aim was to address such misconceptions. To do so, the IBACOS & BEC team focused on addressing the following:

- The impact can quality have
- Focusing on having champions to drive quality
- Ensuring that quality would be seen as a business tool at the strategic, tactical and operational levels
- Using NHQA, EVHA and Builders Challenge as drivers of change over a 18-month timeframe (mid-2009 through the end of 2010)
- Measuring before and after results using NHQA Self-Assessment
- Linking quality to strategy and green building practices
- Using key quality models and methodologies
- Benchmarking with the best in industry builders to show the impact of quality
- Getting employees and trade partners involved
- Using a team focus and creating leaders within the company
- Providing training and development opportunities throughout the organization
- Providing the above with minimal effort

- Providing a framework for WCHH to continue this journey on its own via the use of templates and training

The NHQA is based on the Baldrige Performance Excellence Program and considers the following categories: Leadership, Strategic Planning, Process Management, Customer Satisfaction, Human Resources, Construction Quality, Trade Partnerships, and Business Results.

The EVHA is a national energy efficiency and green building award program. Industry experts evaluate a builder's entire business approach for building high performance homes and conduct a detailed analysis of a particular home model.

The Builders Challenge is a U.S. Department of Energy program to build a new generation of high performance, energy efficient homes using proven innovations. To qualify for the Builders Challenge, a home must score 70 or less on the Energy Smart Home Scale and meet the Builders Challenge Quality Criteria.

The steps for introducing quality at WCHH included the following:

- The Baldrige based NHQA was used as the key driver for self-assessment and improvement.
- The leadership team was introduced to and trained in quality management first so that they could act as leaders and role models for the rest of the company.
- All employees were trained in quality management concepts, with the leadership team acting as facilitators.
- Training focused on the basic concepts of quality as well as the NHQA criteria, self-assessment, Six Sigma, DMAIC (Define, Measure, Analyze, Improve, Control) methodology. Metrics of other builders who had won the NHQA was provided to show its impact. Training also included the use of team charters, team skills, team facilitation/leadership, and quality improvement tools such as Brainstorming, Pareto's 80/20 Analysis, Fishbone-Root Cause Analysis, and Process Mapping.
- Pre- and post-test Self-Assessment Surveys were conducted to measure changes in performance using the NHQA criteria.
- An NHQA 19-page application was produced as a method of conducting self-assessment for WCHH. This also facilitated an application submitted to the 2010 NHQA, which resulted in a two-day site visit and an evaluation by a team of industry and quality expert judges. WCHH obtained a detailed feedback report that identified areas for improvement across the company. This report was used in the 2010 WCHH strategic planning process.
- WCHH visited NHQA and EVHA award-winning builders for benchmarking.
- Seven cross-functional Work Improvement Groups (WIGs) were established to address seven areas determined by strategic planning as high priority areas to

improve. The training included focusing on outlining the charter for one WIG and helping that WIG initiate process mapping in its area of focus.

- Support was provided to establish the charters for each of the WIGs.
- Strategic planning support and tools were provided.
- An integrated Quality, Environmental, Health, and Safety Management Systems framework for WCHH was developed based on integrating ISO 9001, ISO 14001, and OHSAS 18001.
- On going support was provided through conference calls to answer questions and to keep the WIGs and other improvement efforts on track. To keep costs low, this also included telephone and webcam conferences.
- Key on-site visits were conducted to evaluate progress and to give advice.

A Profile of Wathen-Castanos Hybrid Homes

WCHH is a third-generation, high performance (green and energy efficient) home builder that is located in the Fresno/Clovis area of California's Central Valley and that started operations in 1983 as Heritage, Inc. In 1986 the company came under the ownership of three partners: Kevin Castanos, Richard Wathen, and Robert Mazmanian. In 1994 the company adopted the name Wathen-Castanos. The new name, Wathen-Castanos Hybrid Homes, Inc., underlines the importance of green homes as a core strategy. The team currently (2011) consists of 34 full-time employees and is led by its president Mike Nimon. It has built more than 4,000 homes in the Fresno/Clovis metropolitan area.

WCHH builds single-family, detached homes ranging from 1,100 to 2,348 square feet, with a price range of \$128,900 to \$289,900. The target markets are first-time buyers (young professionals), move up buyers (growing families), and move down buyers (empty nesters). Recent buyer data indicate that 49.1% are first-time buyers, 35% are younger than 40 years old, and the average age range of the homebuyers is 35 to 44 years old. The average household income is \$90,565. From 2002 to 2006, the Central Valley experienced one of the fastest growing markets in the country. Since then, the market has become a foreclosure impacted marketplace.

WCHH was ranked at 152 in *Professional Builder* magazine's Housing Giants in 2011. WCHH generated 194 closings in 2010, with approximately \$37 million in sales. In the first quarter of 2010, the company had the highest number of permits issued in Central San Joaquin Valley, California, competing against 54 other builders. The number of permits also reflects the successful identification of niche lots and a competitive and differentiated series of homes. Most of the major national builders come and go, based on market conditions; those builders are expected to return as the market improves. There are four top local competitors, each building 70 to 110 homes per year.

In 2006 WCHH took the proactive step of entering the green home market. This high performance home surpasses the requirements for California Title 24 energy code by approximately 30%, Energy Star, and the Build It Green California programs. In recent years WCHH launched a new marketing campaign that promotes a “Hybrid Home.” None of WCHH’s competitors is achieving the levels of energy efficiency of the Hybrid Home.



WCHH team from left: Josh Peterson, CFO, Mike Nimon, President, Richard Wathen, Owner, Laura Mather, Executive Vice President Sales & Marketing, Kevin Castanos, Owner

Mission, Vision, and Leadership

The Mission Statement of WCHH was developed with input from all employees.

The Mission Statement focuses on the following:

- Treating customers with integrity, appreciation, and respect
- Delivering what WCHH promises, when WCHH promises it
- Hiring excellent people
- Meeting high standards
- Fostering an environment that demonstrates appreciation for the employees and their families
- Sharing the profits and the resources with the community

In support of the Mission Statement is a set of Core Operational Directives that have detailed explanations to enable everyone to understand their meaning. In summary they are as follows:

- WCHH cares
- Customer satisfaction
- Profitability and cash flow
- Process efficiency through continuous improvement and measuring goals

A set of detailed Fundamental Values has been established to guide corporate decisions and behavior. In summary, those Fundamental Values are as follows:

- Integrity
- Dedication to customer service
- Authorship in decisions
- Proactive mind-set
- “Get it done” solutions
- Teamwork and trust
- Continual improvement and follow-up process

The WCHH Vision is as follows:

- Pass on the legacy/succession of WCHH
- Grow in operational excellence at all levels from employees to trades
- Build energy neutral homes as a production builder
- Develop true communities with a value proposition higher than the market
- Achieve 95% customer satisfaction and 95% referral rates
- Maintain a strong cash position

The detailed explanations behind the Mission Statement, Vision, and Fundamental Values allow each to be clearly linked to how they define the corporate culture, strategic planning, and daily operations of WCHH. The results of these actions are articulated in the aligned Quarterly Metrics (rocks), Quarterly Dashboard, Milestones, and Progress Improvement Measures that measure and monitor how WCHH is progressing toward its Vision.

Leaders and managers reinforce this at the start of all company, department, and other meetings as well as through communication tools such as the monthly “From the President’s Corner” newsletter updates. This newsletter updates everyone in the company on, for example, the WIGs in which employees lead and participate in

strategically focused initiatives. Also WIN Success newsletters (where “WIN” represents “What’s Important Now”) are specifically designed to recognize teams and individuals for their work while updating the whole company on the progress of the WIGs.

WCHH leaders act as role models by participating in the Process Improvement Training with all the other employees. By doing this, they show that they believe in quality and find the training essential. Feedback from the company NHQA Self-Assessment Survey is used to identify Opportunities for Improvement (OFIs), including feedback on how leadership can improve.

Strategic Planning

Strategy Identification and Analysis is based on information from a number of sources, all of which are coordinated and focused toward identifying the Strengths, Weaknesses, Opportunities, and Threats (SWOT). This is supported by conducting a two-day event for a Business Process, Strategic Mapping, and Gap Analysis using the IBACOS “Green Blueprint.” An organization-wide Baldrige-based NHQA Self-Assessment Survey and Analysis was also conducted. Demographic data and market intelligence are a crucial part of the strategic planning. Research is conducted by a consultant on local/regional buyer and market information, secret shopper information, trends, competitor analyses, and input from focus groups, employees, and their contacts. This provides only some of the data used to support the SWOT and the creation of the strategic plans.

Strategic planning begins with the clarification of the Mission Statement, Core Operational Directives, Fundamental Values, and Vision. The next step is a review of actual versus planned business results. Then the annual goals are defined and broken down into Quarterly rocks. This includes revenue, net profit, gross margin, cash, sales, starts, warranty costs, and variance dashboards. Projected goals are established and measured against the actuals each quarter. Key Quarterly Milestones are then established to further break down the plans into detail to meet the goals. These Milestones are directly linked to Progress Improvement Measures. These measures track progress and include Customer Feedback to Construction, Option Processing Improvement, and Focused Buyer Follow-up in First Two Weeks After Closing. These clearly defined milestones and the assignment of deliverables ensure that WCHH can actually execute the plan effectively and can monitor its progress.

Process Improvement

The strategic plan defines key areas on which to focus and improve; these are addressed by cross-functional WIGs.

These WIGs were formed by first participating in Process Improvement Training. This included training on the use of the following:

- Team charters
- Team skills
- Team facilitation/leadership
- Define, Measure, Analyze, Improve, Control (DMAIC)
- Brainstorming
- Pareto's 80/20 Analysis
- Fishbone-Root Cause Analysis
- Process Mapping

The initial WIGs focused on the following:

- High performance home strategy
- Local market product research and absorption
- Home delivery process
- Scope of work development
- Option processing
- Sales training
- Customer service feedback to construction

The next round of WIGs focused on the following:

- High performance builder/buyer class
- Quality process procedural manual
- Focused "Two Weeks After Close" buyer follow-Up
- Redefined "First 12 Months of Ownership Customer Care Program"
- Lean/OFI product and systems review process
- Hot spot improvement process
- Buyer road map to home ownership
- HR/employee growth and goals professional initiative for success

Each WIG has its own individual metrics and milestones that have been determined and clarified in its charter. Progress is reported and communicated through quarterly and weekly meetings, emails, the "From the President's Corner" email newsletters, WIN newsletters, bulletin boards, and Quarterly Dashboards.

Key Processes are measured by department and higher level Progress Improvement Measures, Key Milestones, and Quarterly rocks. This allows WCHH to monitor and control processes and to identify OFIs.

As members of a National Association of Home Builders (NAHB) Builder 20 Club and the IBACOS Best Practices Research Alliance, WCHH has access to other builders to compare their performance results, market shares, and study best practices. WCHH also attends conferences such as the International Builders Show (IBS), the Pacific Coast Builders Conference (PCBC), and the Energy and Environmental Building Alliance (EEBA) to participate in training and seminars and to engage in networking opportunities. WCHH also conducted benchmarking visits to builders, including an NHQA winning builder as well as organization outside the homebuilding industry.

WCHH works with some of the industry's best consultants and architects to guide the company with focus groups and market research on local and regional levels. WCHH involves its homeowners in focus groups to better understand buyers' needs and key purchasing patterns to ensure that they are aware of trends and changes.

Employee Focus

Company benefits offered to WCHH include eight paid holidays along with an appreciation week of time off between the Christmas and New Year's holidays; paid medical, dental, and vision for employees; paid time off based on a sliding scale related to time in service; 401K; and a profit sharing plan. Other benefits include a laundry service discount; complimentary snacks, sodas, and teas; monthly birthday breakfast recognition; health and wellness training; community service outreach, serving lunch at the Poverello House; and employee potluck days. WCHH prides itself on the long list of community outreach programs in which it is involved.

WCHH evaluates all positions to ensure that the company is in line with the industry and region for base compensation. In addition to base compensation, all employees have a bonus incentive plan that is in line with the company's annual business plan and goals. In addition to a competitive base salary and company aligned bonus plan, WCHH also provides up to a 3% match of base salary for employee 401k contributions. In 2010, compensation for middle management and front-line employees on base salaries was held through the recessionary times, with these employees making the same base pay as they earned in robust years. Upper management base salaries have been reduced to be in line with the economic times. Extra employee effort has been recognized for increased workload periods such as the second half of the 2009 federal incentive period. Employee bonuses of approximately 8 to 10% of the respective employee's base annual salary for this period were paid out in December as a thank-you for the extra effort and excellent work in producing top quality homes while closing homes at the pace of 30 homes per month for this period. This extra effort was acknowledged in the personal recognition of each employee's efforts and through this compensation.

Training is an important aspect of the employee focus. It includes on role playing and improving key areas to support the Hybrid Homes and other aspects based on secret shopper and customer satisfaction survey feedback.

Leadership training covers the following:

- Vision of the ideal managing leader
- Performance management
- Performance development
- Self-development
- Follow through, culture of commitment
- Effective use of time
- Organizational skills
- Communication
- Self-initiative
- Relationships
- Managing high quality work

Training on high performing home methodologies has also been conducted for all employees, and cross training has become a stronger focus. This training has included the following:

- IBACOS – Building science training of all employees and trades
- Sales weekly "huddles" on Fridays to role play, preparation for weekends, and the study of relationship selling through training with Will Nowell/Value Path
- Home Energy Rating System (HERS) inspector training on building systems for field employees and trades
- PG&E Pacific Gas & Electric training on energy systems from top professionals in the industry
- In-service training on systems and processes for growth and efficiency
- Safe Written Work Procedures, safety, OSHA, and CPR training on a regular basis for all employees

Attendance of conferences such as PCBC, EEBA, and IBS is still seen as important to keep up with industry trends and additional training.

Customer Focus

WCHH is focused on achieving "Evangelical Fans." This starts when homebuyers are at the earliest stages of considering WCHH to build their homes. Online and from the sales models, WCHH offers potential buyers a "We Care—You Compare" chart that lists

all the energy efficient, water conservation, and health focused value-added features of the homes being offered. The chart quantifies the benefits in retail value and provides columns for the potential homebuyer to record information from other builders, quantifying how those builders rate against WCHH.

The WCHH sales team stays in contact with homeowners at every key construction milestone. At closing the homeowner and the home are handed over to a WCHH Customer Care representative. After move-in, the homeowners are contacted at three “Touch-Point” times within the first two weeks. In addition, WCHH surveys buyers at move-in, 6 months, and 12 months to ensure satisfaction.

WCHH has established Referral Education And Promotion (REAP) Touch Points that cover the Shopping, Purchase, Build, Close/Move-In, and Warranty periods. The Touch Points include Marketing, Models, Lender Pre-Approval, Sales Initial Visit, Reservations and Expectations, Construction Orientation, Home Personalization, Sales Building Process Follow-Up and Care, Frame Walk Meeting, Home Personalization Follow-Up, Orientation Welcome with Customer Service, Closing and Orientation to Move-In, Move-In Sign-Off, and then Customer Care at 2 weeks, 30 days, 6 months, and 12 months. Two contact visits and a call to the new homeowner are also made two weeks after close of escrow to verify that they are well attended to throughout their move-in.

Surveys that come back with a score of less than 70 result in the Director of Customer Care calling the homeowner to ask what is wrong and what can be done to resolve any issues and improve in the future.



Construction Quality and High Performing Homes

WCHH fosters the strategy of delivering a high value home with environmentally sound features that are included as standard. Through this strategy the objective is to provide a quality built home while reducing the carbon footprint, water consumption, and waste, while increasing the longevity and durability of the home.

This strategy promotes the homeowner's well-being from an overall lifestyle mentality. Products such as low volatile organic compound (VOC) paint, Forest Stewardship Council (FSC) lumbers, formaldehyde free insulation, 16 SEER HVAC, tankless water heaters, and high efficiency glazing are used. A fresh air ventilation system is used to improve the indoor air quality of the homes. The use of smart irrigation results in approximately 59% less irrigation water with 71% less runoff.

In 2010, WCHH built an "Advanced Performance" or Zero Net Electrical (ZNE) home that included upgrading the tankless water heater to a 0.98 EF condensing unit, the air conditioning upgraded to a 19.2 SEER combined with an annual fuel utilization efficiency (AFUE) 94.7% furnace. The attic insulation went from R-38 to R-49, and the walls were elevated from R-18 to R-20. As a ZNE home, it features a 3.6 kW photovoltaic (PV) array and Control 4 automated power control system. The house has a Home Energy Rating Index of 59 (without PV) and 29 (with PV).

In 2011, WCHH is continuing to evaluate new building systems and technologies and is an active participant with IBACOS in the U.S. Department of Energy's Building America program.

WCHH uses a series of checklists to keep the construction process consistent and as a way to monitor any issues that arise. They also have a House Readiness Incident Report and a Corrective Action Form that help to focus on improvement areas.

In addition to internal inspections, the customer is involved in the quality review process of the new home with a Frame Walk Through at the framing stage, a Walk Through Orientation at the final building stage, and a Move-In Sign-Off appointment at close of escrow to ensure the home meets the homeowners' standards. The homeowners are provided with a Homeowner's Manual at the time of contract and are asked to bring it with them to their Walk Through Orientation. The manual covers all the high performance features and includes an FAQ sheet on the Hybrid Home, a copy of the Builders Challenge Certificate (E-Scale) and the Green Points Rating.

WCHH utilizes Superintendent and Trade Partner feedback on First Time Quality documents for 360° information back to trades. WCHH also uses a third-party inspector through Quality Built LLC to cover all structural and water intrusion inspection, as well as a HERS rating company, Duct Testers, to verify energy performance of the homes, including a whole house airtightness (blower door) test. The HVAC Trade Partner conducts duct tightness tests on every home. This allows WCHH to ensure that the homes are not only built to the highest standards but that WCHH has multiple checkpoints for both corrective and preventive action. Multiple architects are used to help maintain checks and balances in design versus functionality.

WCHH also has a quarterly customer service feedback-to-construction meeting to ensure that both departments focus on opportunities for on-going improvement based on measured feedback from the customers. The opportunities are tracked through completion.

Safety is an important aspect of the building process at WCHH. The practices used ensure not only compliance but also go above and beyond to protect the WCHH employees and the subcontractors' employees are as follows:

- Job site visits by a third party OSHA consultant on a quarterly basis.
- Biweekly meetings are held by a superintendent using Tool Box OSHA compliance documents with a signature by each field employee.
- Once a month random job site visits are made by the safety coordinator for each tract to ensure that safety is being complied by WCHH as well as by subcontractors on the site. A disciplinary action of a warning or fine is addressed for each non-compliance issue for OSHA requirements.

Meetings with subcontractor owners or key field representatives are held once a month by the WCHH director of construction to reiterate any issues or concerns found during prior safety visits by either the third-party consultant or the WCHH safety coordinator.



Blower door and leakage testing

Trade Partners

WCHH fully involves its Trade Partners in the development process of the new plan designs, engaging with the Trade Partners early, with a focus on value engineering and smart design. WCHH also costs out new plans with the Trade Partners early in the process, giving targeted areas in the design that may be modified for better pricing from the Trade Partners. This early involvement with the Trade Partners creates an open line of communication that continues throughout the build process, allowing the Trade

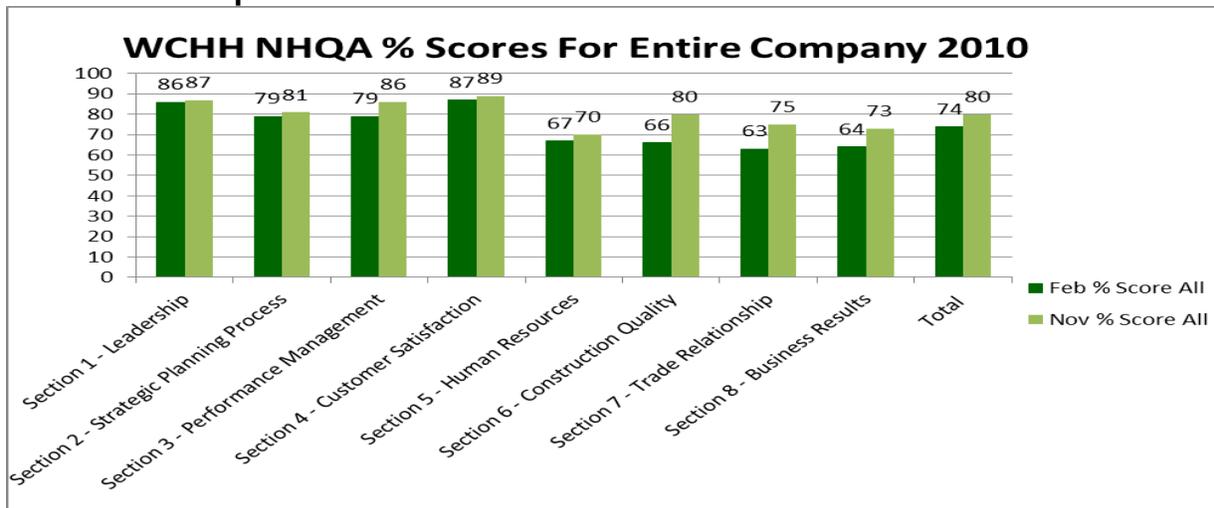
Partners to work more cost effectively. As new plans are completed, WCHH follows up with redline review meetings with the Trade Partners, looking for areas that can be improved.

True partnership is essential. An example of this is that WCHH designed and launched a new series homes in 2009 in only 16 weeks, considered an industry best practice. Trades are considered part of the WCHH team in communication and information flow. Product, market, manpower, resources, and timing are constant subjects of daily dialog.

A monthly “Trade Partner Letter” is distributed to provide updates on sales, starts, and upcoming issues and to provide encouragement and recognition. The WCHH Director of Construction has annual one-on-one meetings with the trades and hosts a biannual trade appreciation event. WCHH also has quarterly Small Group Trade Partner Meetings with the Director of Construction, with a specific agenda that is run through during an open forum. In this meeting, Trade Partners that work closely together in the field discuss areas of improvement that may overlap among them. The comments from this meeting are followed up with action items for different WCHH employees and Trade Partners.

Each Trade Partner’s performance is assessed quarterly by having site superintendents rate the Trade Partners on a 10-question survey. Results of the survey are provided to the Trade Partners for review. Typically, WCHH has a substantial amount of dialogue once the Trade Partners receive the survey results. WCHH also has quality control meetings once a month to focus on the Trade Partners that WCHH has seen decrease in quality or job performance. During this meeting, WCHH will typically go through a hit list of quality and job performance issues that have shown a pattern over the past few months. The WCHH Director of Construction and the Quality Control Representative will meet with the Trade Partner to run through the issues with them. Once completed, the Trade Partner and WCHH Quality Control Representative sign off on the list of items and establish improvement goals. Follow-up meetings are scheduled for a later date to confirm improvements based on the goals that were set.

Performance Impacts



- WCHH improved in every category of the NHQA over a nine-month period.
- Eliant (third party customer surveys) 94.2% customer satisfaction rating was achieved.
- 94% of trades said that WCHH was good or excellent in its focus on establishing a beneficial relationship.
- Pre-walk (prior to homeowner touring home at handover) defects were reduced by 50%.
- A 33% referral rate was achieved.
- The HERS index was reduced as follows:
 - 2008 – 100
 - 2009 – 65
 - 2010 – 50
- The number of homes built per year increased as follows:
 - 2009 – 188
 - 2010 – 194
 - 2011 – estimated 200+
 - 2012 – projected 250
- WCHH won an Eliant National Customer Satisfaction Award.
- Energy Star Leadership in Housing Award was won in 2010.
- WCHH was the EVHA Builder of the Year for 2011.
- **WCHH won the NHQA Bronze 2010 and Silver 2011.**

As for its next steps, WCHH is once again using the NHQA Feedback Report to select the next WIGs based on strategic needs, will be conducting annual self-assessment and applying for the NHQA again in the future. It is addressing succession planning, is focusing on an integrated Quality, Environmental, Health and Safety (QEHS) Management System, and is raising the bar on the performance of its home by working on another IBACOS/U.S. Department of Energy advanced production home.

Conclusions

The work with WCHH shows that the implementation of quality tools and techniques can be achieved in a short time frame, that quality can be created in a way to allow the organization to sustain and expand its application in the future with limited resources, and that the results and impact of quality implementation can be quickly realized. It also shows that quality management provides an ideal set of tools to support and drive the efficiency and effectiveness of high performance homebuilding methodologies.

A clear strategy, communication of the value of the tools and their aim, measurement pre- and post-implementation and clear results were the keys to success. Finally, a

champion with a vision and passion to drive quality provides the ultimate role model and energy to achieve and sustain quality.

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Denis has a degree in Construction Engineering, an M.B.A., and a Ph.D. in Quality Management. A Fellow of the American Society for Quality, he is a Certified Manager of Quality/Organizational Excellence, Auditor, and Six Sigma Black Belt.

Denis has served on the Baldrige National Quality Award Board of Examiners, the National Housing Quality Award, and the International Team Excellence Competition. He is a member of several boards including the U.S. (ANSI) Z1 Standards Group for Quality Management, ASQ's Quality Management Forum, and Quality Press Review Boards. He has also co-authored *The Executive Guide to Understanding and Implementing the Baldrige Criteria*.

Denis developed and implemented integrated quality, environmental, and safety management systems at Veridian Homes in Madison Wisconsin, earning Veridian Homes the National Housing Quality Award, Energy Value Housing Award, Innovative Housing Technology Award, NAHB Safety Award for Excellence, and *Professional Builder* magazine's Builder of the Year. In 2007 Denis won *Big Builder* magazine's APEX Award for his work in Quality Management.

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Duncan has nearly ten years of experience at IBACOS, assisting builders and developers with implementing high performance housing using Building America research results. His research focuses on process-related barriers that can be found in most builders' organizations, with the goal of creating new process models for builders. Duncan plays a strategic role within Building America and participates in the Building America QA/QC working group. Previously, Duncan was a partner at Spectrum Design

Collaborate, LLC, and a Program Manager for the Energy Crafted Home Program with Northeast Utilities. He is a Registered Architect in New York and earned a Bachelor of Architecture degree from Rhode Island School of Design.

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