

## Success Story

# SGI® Reality Center™ at QMI Reality Works Enhances Large-Scale Manufacturing and Public Works Projects

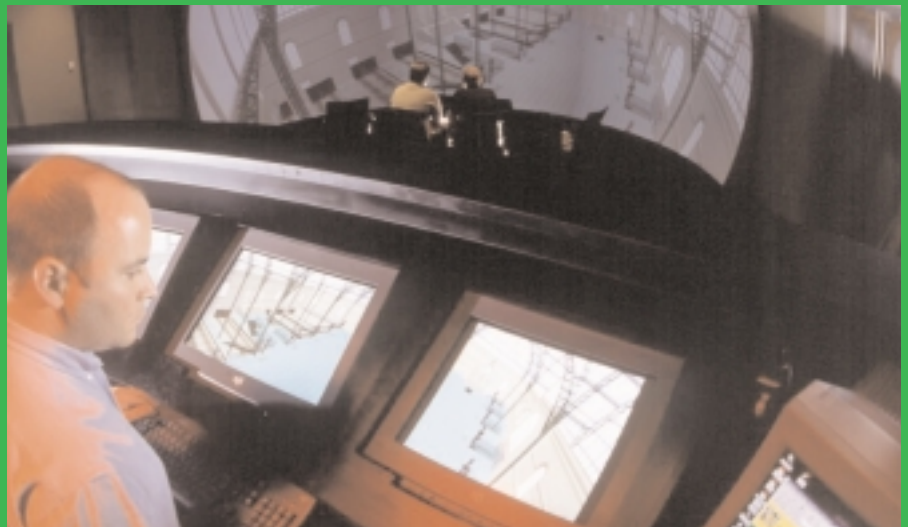
Continuous improvement is imperative in manufacturing. Companies that fail to innovate can quickly perish in the face of an ever-changing marketplace. Queensland Manufacturing Institute Ltd (QMI) was established in 1990 to help Australian companies improve their competitiveness through the use of the latest technologies and methodologies. QMI serves as a technology diffusion center, providing world-class manufacturing technology, applied research, advanced technical training, and a single point of entry to a vast network of expertise and services.

Five years ago QMI opened its Visual Manufacturing Centre, a state-of-the-art facility offering a complete digital art-to-part environment in which the most advanced design tools available can be applied to all phases of product design. From its inception the center has relied on computer equipment from SGI to drive the visually oriented and compute-intensive software needed to produce 21st-century designs. Clients access the latest CAD, CAM, and CAE software running on SGI® visualization systems and visual workstations to improve designs and streamline product manufacturing.

According to Nelson Frolund, center manager, “By providing our customers with access to the latest technologies, we can help them improve quality, efficiency, and time to market. QMI customers also find that use of the latest techniques helps them reduce costs and improve their overall competitiveness. SGI hardware and the expertise of SGI personnel are a critical component of the services we offer.”

### Reality Works—Taking Visualization to the Next Level

In October 2001 QMI opened its new Reality Works virtual reality center, expanding the capabilities it offers to its clients. The centerpiece of Reality Works is an SGI® Reality Center™ facility powered by an SGI® Onyx® 3200 visualization system. A theater-style room seats up to 25 people and houses a 3-m by 7-m spherically curved screen. Multiple projectors create a 3D digital image of a design or other data, providing a 150° view of the object in a fully immersive environment. Using the Reality Center facility, design teams



The placement of control consoles in the rear of the viewing room allows clients to solely focus on reviewing the project without thinking about the technology.

can gather to collectively review life-size models, make important decisions, and avoid costly mistakes.

In its first major design success, Reality Works was contracted to help optimize the turbine blades for a new hydroelectric power plant. The customer was referred to QMI as a possible source for casting parts—QMI operates a multimetal prototyping foundry as one of its services—but quickly discovered that QMI and Reality Works could provide a single point of contact for much more of the project, including CAD modeling, computational fluid dynamics (CFD) analysis, and rapid prototyping.

Starting from a preexisting design for larger turbines, a scaled-down design was created. The efficiency of the new design was modeled using CFD software. This modeling was performed on the SGI Onyx 3200 visualization system in order to take advantage of its advanced computational capabilities.

The engineers performing the CFD analysis were pleased with the stability and performance of Onyx 3200, and the project resulted in a projected 5% efficiency gain for the turbine. The new design improves the efficiency and productivity of the

power plant as a whole. After the design was completed, QMI produced rapid prototypes of the improved blade design using stereolithography. These prototypes are used directly in casting the final parts.

### A New Approach to Public Works

The new Reality Center facility at Reality Works is enabling QMI to help a whole new set of clients. The immersive visual environment is ideal for urban planning, residential development, architectural modeling, and related fields.

Because of the value that Reality Works brings to these projects, the state of Queensland was a major investor. According to Ken Porter, executive chair of QMI, “The new Reality Works facility, financially supported by the Queensland state government, provides significant benefits for a range of large-scale projects across Queensland and all of Australia. Studies indicate that visualization can reduce the cost of such projects by 5% on average. For the AUD\$45.1 billion worth of current and planned projects in Queensland alone, the use of visualization could result in a very significant savings, more than justifying the initial investment.”

# The Reality Works Mission: To help Australian companies become more competitive by providing skills, knowledge, and best practices in virtual environments.

## Reality Works

Reality Works services Australia, New Zealand, and the entire Asia-Pacific area, providing advanced real-time visualization capabilities with its state-of-the-art SGI Reality Center facility.

**Staff:** 7

### Hardware

- SGI Reality Center facility powered by an SGI Onyx 3200 visualization system
- Silicon Graphics® Onyx2® visualization system
- Silicon Graphics® Octane2™, Silicon Graphics® Octane®, Silicon Graphics® O2®, Indigo2™, Silicon Graphics® 330, Silicon Graphics® 320, and Silicon Graphics® 230 visual workstations

### Software

- FLUENT for CFD analysis
- I-DEAS for CAD modeling and FEA
- Pro/ENGINEER/MECHANICA for CAD and FEA
- Relax real-time modeling software
- Multigen Creator Pro and Vega for simulation development
- Division Mockup for digital prototyping

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The state of Queensland has been experiencing rapid growth and is working hard to develop the necessary infrastructure to keep pace. Because even minor mistakes in large infrastructure projects can be expensive to correct, the state has been collaborating with Reality Works to explore the effects that designs will have on surrounding areas, including visual and environmental impacts and safety. Increased consultation with various groups interested in major projects has been greatly facilitated.

In the first major visualization project, the Queensland Transport department used the Reality Center facility to model a section of the new Inner Northern Busway, a dedicated mass transit system that runs north from the central business district of Brisbane. One critical section of the project passes through a park and a golf course close to the city. With Reality Works, the state developed a full fly-through 3D model of this critical section of the busway to help minimize its visual impact on surrounding neighborhoods. Overlaying aerial photography onto 3D topography and adding roadways, trees, buildings, and moving buses provided a very detailed view of the landscape, allowing them to determine the visual impact of tunnels and road cuts and to decide where additional landscaping was needed. Potential flaws in the initial CAD models were rapidly apparent in the fully immersive 3D model. Without the 3D model these problems might have escaped notice until further into the project, when changes are usually much more expensive to make.

The initial phase of the project is now completed, and three contractors are reviewing the model in preparation for bidding on the construction phase. The government is encouraging these prospective contractors to modify the models in order to arrive at the most cost-effective design with the lowest impact.

### An Alliance for Success

The close working relationship between QMI and SGI stretches back to the early 1990s. QMI depends on SGI not only for computer equipment but also for the experience and expertise of SGI personnel. In addition, SGI often directs customers to QMI when they can benefit from QMI services.



Reality Works' immersive theatre, with 25-foot spherical screen, allows group review of complex products at high resolution.

"The help we have received from SGI has been instrumental," said Nelson Frolund. "SGI was selected as the primary vendor for Reality Works in large part because of the depth of experience of SGI people. There aren't many visualization facilities that offer commercial services. We had to hit the ground running, so it made sense to go with SGI for their vast expertise."

Reality Works has contracted with SGI for a center consultant to help with structuring and staging real-time visualization projects. SGI also supplies a real-time programmer and a systems engineer to provide ongoing assistance. SGI has itself made a significant financial investment in Reality Works. According to Bill Trestrail, SGI's regional managing director for Australia and New Zealand, "We are partnering with Reality Works because we believe that ready access to Reality Center technology offers major benefits to Australian businesses. Immersive visualization enables communication of complex ideas and concepts across disciplines in a visual language that everyone can understand, improving design quality and reducing mistakes."

Still in its first year of operation, Reality Works is already proving its value to QMI customers. SGI and QMI are committed to expanding the services at the center as they build awareness of the benefits that visualization technology brings to large-scale projects.



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