

# PAS Technologies leans on throttle for fast track to process excellence

In July 2006, Gridiron Capital acquired the Praxair aviation repair business and established the new corporation named PAS Technologies, headquartered in Kansas City, Missouri, because of its long-standing reputation for innovative, proprietary, high-technology repair processes and solutions in the aerospace and industrial sectors. Then Gridiron named Robert (Bob) B. Weiner president and chief executive officer.





**W**ith his renowned expertise in implementing lean six sigma, Weiner immediately assembled a strong team committed to achieving process excellence. In just six months, that strategy was implemented at the company's five plants in the US as well as its Singapore facility and this resulted in:

- 58 per cent decrease in turnaround time;
- 67 per cent improvement in on-time delivery;
- 80 per cent reduction in overdue backlog;
- 60 per cent improvement in inventory turns;
- 38 per cent drop in customer complaints;
- significant sales growth.

Today, PAS Technologies is a global aerospace and industrial market leader for turnaround time on commercial and military maintenance repair and overhaul. The remarkable, fast-paced results continue to improve on a visible, daily basis.

"Our lean repair process involves a total commitment to customer satisfaction," says Weiner, as he outlines the company's strategy for success. "That's a significant change from the previous emphasis on productivity improvement and cost reductions."

What do PAS Technologies' customers want most of all? Ultimately, every one of them expects on-time delivery (OTD) of quality components, says Weiner. "How do we make that happen?" he continued. "Through a single-minded drive to improve two key business measures: turnaround time (TAT) and on-time delivery (OTD). The fastest turnaround time wins the market every time, it's that simple."

#### *Hit the ground running*

While the basic formula for success may be simple, the speed of implementation has been a critical factor in PAS Technologies' rapid improvements. According to Weiner, the first task was to select leadership that would drive the new, high-performance, lean six sigma culture

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with fast efficiency.

While Weiner took the helm in a hands-on way, he immediately brought in Dan Fayer as vice-president of quality, process excellence and customer service. Weiner and Fayer had previously worked together on successful global lean implementations at Pratt & Whitney and Exide Technologies.

The next step was to hire Lean Value Solutions (LVSI), lean management consultants who both Weiner and Fayer had worked closely with on past projects.

“The addition of LVSI demonstrates just how committed PAS Technologies’ senior management is to the lean six sigma culture,” Fayer noted. “It has full support with a budget for consultants and all the lean six sigma tools and training, equipment and production team members that are needed to get the job done right.

“We chose LVSI because they’re familiar with the aircraft engine business, including our customers,” he continued. “They came into PAS Technologies with an objective view

and tremendous knowledge and training skills that made it possible for us to hit the ground running in the first two weeks.”

### *Hand-picked lean teams*

To get started, a select number of employees from all levels of the organisation were sent to Kansas City for an intense, one-week training programme. During the first four months, 15 per cent of company employees acquired the lean tools and concepts at five training sessions, including one in Singapore.

“We picked individuals from management to the production floor with strong leadership qualities, and they became the nucleus of the lean teams for each product line,” Fayer said. “But to be successful, it took a total team commitment and effort...with no place for anyone who can’t deal with change.”

To apply their newly-acquired lean skills, the five- to seven-person teams spent the next two weeks performing the pre-Kaizen event that involved preparing detailed analyses of a specific product line in their own plant. Operational times and motions were charted, including timing the parts moved by people (manual time) and machine (auto time), plus the wait time and the queue time. During the fast-paced, week-long Kaizen event that followed, that data was supported by the LVSI consultants to identify ‘value-added time’ versus ‘non-value-added time’, with the ultimate goal of eliminating ‘waste’ (every single unnecessary action).

Each Kaizen crew, including an LVSI consultant, a specially-trained lean manager, and the production floor Lean team, used the analysed data to create a new, step-by-step work flow through their shop that would significantly reduce turnaround time. They worked together to apply and modify the new plan for sustainable process excellence.

That week of turning the production line upside down was immediately followed by a six to 12 week sustainment or coaching phase to track and monitor progress and results.

“It’s important to note that our parts repair is strictly dictated by the list of OEM and FAA, regulatory-controlled documents,” Fayer said. “So we can’t change the process steps, such as fluorescent penetration inspection. Instead, we have to change how we flow the parts through the shop. That’s done by rearranging the ‘furniture’ in a way that will eliminate wasted time, excess part and operator travel and movements.

“We also recognise that we can’t take a cookie-cutter approach,” he added. “So the training, planning and implementation involved using the tools and resources (people and equipment) necessary to achieve process excellence for each individual product line. Even with that, we’ve built in daily flexibility to manage each order.”

### *Compressor blades turn faster*

From July through December 2006, PAS Technologies performed a total of 10 Kaizens that resulted in significantly reduced turnaround times for 20 product lines. Of those, one of the best examples of dramatic improvements to process flow was achieved at the compressor blades repair shop in Kansas City.

The compressor blades process was chosen for analysis because of a constant backlog of parts for repair. After the lean team detailed and analysed the existing batch process, they identified one major problem: all engine sets ordered were received and, rather than controlling parts input, were pushed into the repair process at once, causing severe bottlenecks throughout the shop. The production team’s goal was to process as many parts as possible during their shift, instead of having a precise daily goal and turnaround target. The bottlenecks were hidden by the big stacks of backlogged parts at all the workstations that provided continuous work and overtime for everyone. The result: turnaround time took longer than the customers expected.

“During the Kaizen event, our team broke the process down into five cells, each with efficient, value-



added steps,” said Tony Morgan, product line manager for compressor blades in Kansas City. “Instead of pushing in as many parts as possible, the new cell process pulls the parts through, from cell to cell, so that the turnaround time is easy to manage and track.

“The best thing was that the entire team came together and made it work,” he noted. “They set up new cells using the best information at the time, and worked together to iron out the wrinkles. At the same time, they trained new staff, cross-trained everyone, and kept the old process going until all the new cells were up and running. We now have a much tighter knit product line because of those efforts.”

### *A ‘can-do’ attitude*

Kelly Robinson was chosen to represent the production floor on the compressor blades repair shop’s lean team. With nine years experience at the Kansas City plant, as well as certification in torch operation, shot-peening, glass beading and final inspection, she has a thorough knowledge of the complete repair

<b>Five new cells for the compressor blade repair shop</b>	
Cell 1	receiving incoming parts, machining
Cell 2	grit blast, nitrate stripping, swing-arm grinder, fluorescent penetrant inspection
Cell 3	blending, glass bead, vibro-finishing, shot-peening
Cell 4	re-ID, masking procedure, tip coating, de-masking, gauging
Cell 5	anti-gall, air seal, ink stamp, boxing, paperwork for customer service and shipping



process and a 'can-do' attitude.

"I've had lean and six sigma training before, so when I was first introduced to the training I thought, 'Another class...same old, same old,'" Robinson recalled. "But after the second day, I started looking at it differently because the training consultants, managers and I discussed back and forth what would work best. Since I am a production worker, I knew what would and would not work. They asked for my opinions, listened to

me, and used my ideas. That's when I totally bought into the lean process as a team effort."

During the Kaizen event, the lean six sigma team transformed the compressor blade repair shop into five cells (see chart below). The goal was to process each part in a five-day period, while ensuring 'first in, first out'. To create a simple, visual process, the days were referred to by a letter and a colour (i.e. Day A, blue; Day B, yellow; Day C, green; Day D, orange; and Day E, pink).

The colour-coding was used to identify each day's input on the re-designed floor plan. The colours also made it easy to track the parts repair process visually on a large white board at the front of the shop. This system allows everyone, including visiting customers, to see the parts flows, identify which parts are in which cells that day, and quickly calculate completion times.

The new cell process was initially calculated to start up with 650 parts. But the lean team recalculated and quickly realised that they needed to process 800 parts per day to eliminate the backlog efficiently. By using lean tools such as 'spaghetti diagrams' to analyse people and parts flow, developing a new layout in each cell based on standard work combination sheets and takt time bar charts, as well as launching a robust 5S (sort, set, shine, standardise and sustain) initiative, the turnaround time was reduced from 25 days down to five by the end of the first week.

"It was terrific!" said Robinson, who took the lead that week. "It was so much work, but we made it happen. "Knowing that senior management is backing you all the way makes the difference," she added. "Cross-training also gives us more flexibility to move people to different cells, rotating the skills to best utilise everyone. And consistency is important."

The lean process has become a habit for the compressor blades repair team, with everyone checking the board every morning, participating in tool box meetings during first break and group and plant meetings at least once a month. To date, they have completed several Kaizens in the cells as they continuously look for and find ways to improve each cell process.

Gaining control of the flow of parts through the new, streamlined process with total commitment of every team member is the winning combination, according to compressor blade team leader Gary Kelly. "When we started last year, one-piece flow seemed impossible," he said. "But with our lean cell



process strategy, if a part is going to sit somewhere, we let it sit up front and control the way it goes through the cell.

"Five people went through the lean meeting and training," Kelly noted. "But without the rest of the production team members, it wouldn't work. Everyone has to be on board. And during the Kaizen events, it's important to keep the other team members informed of the changes so they understand and buy in."

### *'How did we operate before lean repair?'*

PAS Technologies' general manager Dan Smith in Hillsboro, Ohio, wondered that out loud as he described the tremendous sales growth that is the direct result of the lean six sigma process. "We've performed many, many Kaizen events since last summer," Smith said. "After our first event in the Hanger Cell when we accomplished what we said we would in the first week, our team members were convinced. That was very reinforcing.

"Previously we were always on the edge of meeting and not meeting our on-time delivery requirements — any little thing that went wrong made us late," he explained. "By revamping the entire product line with dramatic changes to the layout, we started pulling the product into the cell and metered what we released. A standard amount of work and parts are introduced and completed every day, eliminating the big bulge of parts that can become a bottleneck at the end of the day."

Smith's highlights of the total lean six sigma process include:

- Kaizen events that left only value-added activities and equipment in place;
- applying the basic concepts of lean repair to all areas, including metering the amount of product coming in to gain control on the production floor;
- creating production schedules with target dates for completion that were supported by the flexibility to add

cross-trained human resources as needed;

- the full and visible support of senior management;
- total productive maintenance activities that will ensure daily maintenance and monitoring of equipment that is essential to the repair and manufacturing processes;
- and communication every step of the way.

### *Smith: 'Everyone began talking about the customer.'*

Now that had to be music to president and CEO Bob Weiner's ears! With 'customer satisfaction' the single focus of PAS Technologies' lean six sigma process, having all of the Hillsboro plant employees 'talking about the customer' instead of 'productivity improvement and cost reduction' was a giant leap forward.

Communication is a huge part of making the whole process work. It involves:

- visual communication through colour-coded schedules on production boards that enable team members to quickly jump on potential human resources or quality issues;
- a Kaizen newspaper that tracks all of the events to help keep everyone on schedule;
- during the Kaizen events, daily close-outs have Lean teams report on the day and what's coming tomorrow, while end-of-week close-outs are attended by a senior management team member in person or by teleconference (Bob Weiner makes it to 99 per cent of them!);
- daily sharing of customer comments that come by phone or e-mail;
- and team recognition awards at plant and corporate levels to celebrate the successes.

### *Growing sales: the ultimate compliment*

Quality, process excellence and customer service vice-president Dan Fayer describes 2007 as the 'optimising phase' for fine-tuning the lean repair cell process aimed at process excellence.

This year, 60 Kaizen events will be completed at PAS Technologies' six

### **PAS Technologies' plant locations**

- **Kansas City, Missouri**
  - Fan blades
  - Compressor blades
  - Carbon seals
  - Airframe components
  - Landing gear components
  - Vari-vanes
- **Hillsboro, Ohio**
  - Vane sectors
  - Honeycomb
  - Manufacturing
  - Frames and cases
  - Stator segments
- **Tulsa, Oklahoma**
  - Turbine airseals
  - Fuel manifolds
  - Compressor airseals
  - Compressor Ducts
- **Phoenix, Arizona**
  - Stators
  - Carriages
  - Pistons
  - Valve bodies
  - Housings
  - Clutch plates
  - Tank plating
- **Miramar, Florida**
  - Gears and components
  - Tank plating
- **Singapore (Asian Surface Technologies)**
  - Fan blades
  - Aviation coatings

plants. At the same time, each location will hold many two-to-three-day 'total productive maintenance' events, performing triage on machines that have been identified as potential stumbling blocks in a technology-dependent industry.

"Thanks to all of our lean six sigma activities so far, our turnaround time is consistently at or below our quoted turn-time, and our on-time delivery rate is closing in on 100 per cent," Fayer said. "That's resulted in big increases in orders from both existing and new customers. And growing sales are the ultimate compliment!" ■