ERP Implementation for Corporate Growth and Sustainability

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Abstract

This case study discusses the problems a growing high-tech company faces and how it responds by selecting new Enterprise Resource Planning (ERP) software. It describes the process they used in selecting a 'best fit' ERP vendor, how they developed a time frame to train employees and implement the new ERP system, the challenges they faced, and the metrics they used to measure the progress. This paper highlights a successful ERP selection and its implementation, and showcases a real world example of the benefits and success the company experiences as a result of this process. Further, it discusses the specific problems the firm encountered along with the course to operations improvement in the areas of Quality, Lead Time, Production Scheduling and Control, Finance and Accounting, Engineering, Marketing, and its ability to better satisfy customers' expectations. The paper concludes with a series of lessons learned in the ERP selection and implementation project for continuous operations improvement and sustainability of the organization.

Keywords: Engineering, ERP, Metrics, Production, Scheduling, Sustainability, Quality, Vendor.

1. Introduction

In the global economy there is fierce competition to win customers and retain them. A business organization must offer better value in the areas of quality, service, technological expertise, and total cost to keep the customers satisfied and earn their trust and business. Continuous improvement in all areas is needed to remain competitive and maintain the sustainability of the organization. This will ensure current profitability that will also continue in the future.This study describes the process a young high-tech firm deployed to remain competitive and grow by developing a strategic plan to reach short and long range corporate goals. It explores the strategy, tactics, and operations that the company pursued to meet its corporate goals. Organizational strengths and weaknesses are also analyzed to identify areas for further improvements.

After a carefully understanding of the dynamics of the market the firm serves, the CEO Gilling of Diamond Antenna & Microwave Corp. identified a set of realistic goals for his Management Team (MT) to develop a plan for continued success. The MT realized the strongest assets of Diamond are its talented employees and its engineering and technological expertise. The Team also realized that the current EVO software for Enterprise Requirements Planning (ERP) (9) didn't have the capability to offer all of the Supply Chain Management (SCM) functionality the company needed. Diamond needed a software system that would have the tools to integrate all areas and functions of business, including Customer Relationship Management (CRM), Marketing & Sales, Engineering, Quality Control, Production and Inventory Control, Finance and Accounting, and Purchasing – Supplier Relationship Management (SRM). The Management realized that there was a need of training and guidance for its dedicated workforce to help the organization continue to be competitive and realize the full value from an ERP system(6) (procedures, policies, and guidelines).

The study outlines the steps taken by the CEO to set the corporate goals and the strategy to be followed by MT to achieve them. Conclusions that can be drawn both from successes and shortfalls of this experiment are summarized(2)(3). Although each organization's operating environment is different and its strategy for continuous improvement and sustainability is unique, yet organizations contemplating similar moves for competitiveness and growth may benefit from Diamond's experience shared in this presentation.

2. Background

Diamond Antenna and Microwave Corporation, a growing high-tech company, engages in the design and manufacturing of microwave rotary couplers. Its technologically sophisticated product line includes rotary joints, precision microwave rotary couplers, and microwave air traffic control rotary couplers. The company also manufactures slip rings for propeller de-ice, propulsion generator, wind power generator, air traffic control radar, gun turret, radar antenna, semiconductor processing equipment, medical and security CT scanner, and rate table, as well as provides generator/motor applications. In addition, it offers repair and refurbishment services to its clients. The company's products are used in radar, air traffic control, land-based, and satellite communication systems, as well as in airborne, vehicle mount and shipboard satcom-on-the-move pedestals. Diamond Antenna & Microwave is Massachusetts based and was founded in 1956.

The article: "Littleton Manufacturer Sends Plenty of Positive Signals," in the Worcester Business Journal, May 2009, by Staff Writer Matthew L. Brown offers more background on Diamond Microwave and Antenna. It reports in part: To an outside observer, the thought of a company considering buying another may seem daunting. But there is a way to keep it simple and the CEO Gilling of Diamond and the rest of the investment group that bought Diamond Antenna & Microwave in 1994 demonstrate that: Make one thing. In the case of Diamond, that one thing is a microwave rotary joint. Today, Diamond is the largest independent manufacturer of microwave rotary joints in the country. When Gilling and his team of investors bought Diamond, the company was making several different components including antennas and adaptors.

But the rotary joints are what attracted Gilling, who had a background in small manufacturing. The rotary joint is a highly technical product, technical enough to present "barriers to entry" for any potential competition. Also, the product gives Diamond a spot in a niche market that totals only about $100 million worldwide. Diamond's rotary joints at work have two applications: Radar systems and satellite communications. The most obvious place to find a microwave rotary joint at work is the spinning, orange antennas along an airport runway. The microwave rotary joint is what allows components like those antennas to rotate continuously while sending or receiving signals. Rotating satellite dishes or antennas can't use cable. It would simply get twisted and break. So, a rotary joint allows a coaxial cable to be cut while maintaining a microwave signal between communications components and their base. Diamond makes what it calls "simple" rotary joints that can handle up to three channels, as well as units that can handle up to 12 channels for use in air traffic control. The joints can also house other components such as lights, switches and even heaters.

Now, a company that concentrates on making essentially a single product may not strike to be anything but lean. However, Diamond recently underwent some quite serious lean manufacturing training provided by Massachusetts Manufacturing Extension Partnership. The company employs about 50 people and has the capability to make virtually everything for its products at its manufacturing facility. Still, "we realized we needed to get better systems in place in order to grow(8)," Gilling said. "In this region, we will never compete with some other low-cost regions or low cost countries, but we have to keep leading in the development. You can stay there and become a lifestyle company for the owner or you can put the systems and management in place to continue to grow." Diamond has been in business since 1956. When Giling and his partners bought it in 1994, it was very weak in sales and the marketing arena and lost money that year. However, the company has been growing since 1995 and has relocated its operations a couple of times.

3. Problems and Goals

Diamond Antenna & Microwave is an independently owned technology design and manufacturing company. Their product line of microwave rotary couplers is used in radar and satellite communication antennas, while the next generation in slip ring technology, the Roll Ring, is used for transferring electrical power and signals in a variety of rotating applications. Both of these products are designed and produced at the Diamond Antenna & Microwave facility in Massachusetts.

For Diamond, 2009 had been a very successful year ($10M), but it had been exhausting for management as well as the workers for several reasons. The lack of timely information often led to delays, mistakes and re-works and other added costs had direct impact on the bottom line. The company CEO saw an opportunity for strong growth in the market that Diamond served and challenged the Management Team and workers to target a growth of 30% by 2013. To do this Diamond would have to solve many problems and create a vehicle to reach the 2013 goal.(3)(4)(10)

However, in early 2010, the Supply Chain/ERP Manager Eyles began discussions with the CFO Christie and the CEO Gilling about the limitations of the current ERP system (the Legacy system) that Diamond had been using for many years. Diamond was experiencing solid growth but had a number of limiting factors governed by its current EVO ERP system. Sales and Marketing were having a difficult time promising customers accurate lead times and delivery dates. The Quality Department had a large backlog of incoming material, components, and assemblies that were needed by the Production Department(see Diamond Open PO by Due Date). The Purchasing Department was having issues with the vendors – on time performance, quality and pricing as well as not having future requirement visibility from the legacy system(see Diamond Open PO $ by Product Code, Diamond Open PO by Due Date, Diamond On Time Delivery Report). Production Department had trouble tracking jobs – Work In Progress (WIP), and the Finance Department had a difficult time to predict cash flow due to missed scheduled delivery dates to customers. Approximately, 60% of Diamond's business was with the US Government agencies and late deliveries led to severe penalties as well as potential loss of future business.

The major shortfall of Diamond's legacy EVO ERP system was that it didn't offer the functionality to fully integrate Quick Books (Financials, Budgeting and Accounting), Solidworks (CAD CAM software) and Quality (Metrics and Assessment) as part of a well integrated corporate wide solution(9). To upgrade the software to a current revision would not add the needed integration of all functions within Diamond either. The ERP manager argued that upgrading the existing system would be like throwing good money after bad and outlined a plan to move Diamond forward with a completely new and well supported ERP system. He also wanted to insure that mistakes of other companies must not be repeated (3)(5)(8)(10).

The problems that Diamond faced included both the current ERP system not being fully integrated with all functions (Quality, Operations, Finance, Engineering, Sales, and Marketing) within the firm as well as a workforce that needed further training in the processes of manufacturing operations and control to be truly world class. Without a clear strategy and the tools to meet corporate goals, Diamond's business would suffer. Backorders, for instance, would continue to grow, both internal and external quality problems would increase, ultimately sales would suffer, customers would be lost, and revenues and profits would decline. The CEO illustrated quantitative and qualitative review of Diamond's past growth and capabilities, as well as his understanding of the niche market that Diamond had been serving. He showed his confidence in Diamond's ability to grow to $13m in sales by 2013. Although, the corporate goal of 30% growth by 2013 was considered to be realistic and achievable by the Management, it would require a major effort to be realized. Management was up to the challenge and understood that an Integrated Supply Chain Management philosophy and process improvement would be needed.

4. *Literature Review*

Introduction to ERP (9) offers a vivid history of the evolution of ERP from Materials Requirement Planning (MRP) to Manufacturing Resource Planning (MRPII) to a fully integrated state of the art Enterprise Resource Planning (ERP) system that will help organizations compete, grow and thrive today and into the future. ERP as a Process (6) walks us through how ERP takes the functions of operational planning and control and combines them with all of the other business functions to create a synergistic, knowledge-based management environment. The ERP manager at Diamond has a strong Project Management and MRP/ERP experience.(6) His expertise would be fully used in educating and training Diamond personnel to make the selection and implementation of the new ERP software a success(3). Come Down from the Clouds (4) lists the project triad – the three groups that must effectively collaborate for a software implementation project to be successful and the steps that should be taken to insure project's success. At Diamond, the CEO, Functional Managers, and the Technology Manager worked in full collaboration to insure a successful project execution and its desired outcomes. 2008 ERP Challenges (1), available from APICS.org, offers a tool to rate the functionality of different ERP vendors to help firms in their ERP vendor review and selection. Also a good checklist is the 10 Golden Rules of ERP selection (10) to use as a basis to build own system.

The ERP Implementation and Project Management (8) explains what Project Management is and lists the stages of Project Management from Concept/Initiation to Development to Implementation and to Operation and Maintenance. The ERP Project at Diamond is going through all of these stages. Communities of Practice (7) as well as The Dos and Don'ts of ERP Deployment (3) and ERP Implementation Gone Awry (2) list common pitfalls that one should be aware of and work to avoid. Consistent training, testing, document review and continuous improvement would help Diamond avoid these pitfalls. Achieving Successful ERP Implementation after the Go-Live (5) lists the goals key team members must be able to achieve to maintain ERP success. The ERP Checklist – 10 Golden Rules for choosing an ERP System (10) is one of many checklists that are offered from Software vendors and Operations Management Consultants. A checklist can also be developed internally to match organizations' needs.

5. Strategy and Timeline

Diamond's strategy to determine the best ERP system for its business was to have an open team approach, allowing all managers to express their needs and collaborate in the selection process of an ERP vendor that would be the best fit overall. From the list, six (6) potential vendors were selected for initial contact and review. Diamond sent a detailed Request for Proposal (RFP) (see Diamond RFP March 2010) to the vendors. The MT reviewed the initial responses from these vendors and quickly filtered out three (3) due to functionality and cost. The remaining three (3) were questioned in detail about their system capabilities and support; and, most importantly, how well they would satisfy Diamond's current and future system needs. In July – August 2010, they were invited to give presentations, demonstrating how each system would perform. The ERP manager at Diamond explains how the final ERP vendor was chosen: Epicor, Global Shop, and Infor Visual ERP matrix ratings were taken (see Diamond Vendor Scoring Matrix). The Management Team had open discussions and posed questions/concerns. We then voted with M&M's. Three colors were used to signify weighted value; each member had 3 "high" beans, 2 medium beans, and 1 low bean to cast in each vendor's jar. The vendor with the highest bean value was then selected.

Further discussions led to the Management Team making the decision to choose Infor Visual ERP software. The CFO Christie worked with the Executive Team and Visual to ensure that costs and unforeseen fees would be within budget and maintained strict financial scrutiny throughout the project. Consultants from Infor worked with the Diamond Executive Team to make sure that they had a broad understanding of the ERP software and its capabilities. The test system was installed in September with the plan to begin training of Department Managers in October 2010. Synergy consultants worked with the ERP Manager to cleanse the data from the legacy EVO system and to download all data to the new Visual ERP system. An ERP Implementation Associate was contracted to work for the planned six month duration of the ERP Implementation project with Diamond's ERP manager to train all department managers and employees in their functional areas. Documentation of all Functional Flows (detailed step by step instructions highlighted by computer screen prints) would be developed, modified and saved for reference and as training tools for existing and new employees.

The "Go-Live" goal was to be six months from the start of Implementation. The Executive Team felt comfortable that it was a realistic and accomplishable goal. The ERP manager had many years of corporate Materials Requirements Planning (MRP) and ERP and Project Management experience working with P&G and understood the need to adhere to a strict timeline and to keep the company and employees focused so that this project would be successful and offer real bottom line benefits.(3)(5)(8) A brief history of MRP and ERP highlights the value of an ERP system as an integrated approach to Operations Management (9). By the "Go-Live" time all users and end users would be trained and would have to pass a readiness assessment test conducted by Synergy. These assessments and qualifications or certifications of employees would be needed to meet ISO and US Government requirements.

6. Implementation and Training

The ERP manager named the Diamond Training Conference Room as the "Moose Lodge." When asked, he explained his reason for choosing that name: "A metaphor for voicing concerns & issues is 'get the Moose on the table.' I used this in an initial company meeting deploying the MRP initiative. The term was unfamiliar with Diamond personnel, so the 'Moose' became a theme for identifying and resolving concerns and issues." The Moose Lodge offered team workers (the students) an setting that fostered a team spirit in a non- threatening environment that was friendly, cooperative, and provided plenty of fun.

The Moose Lodge atmosphere was an important factor in raising the confidence and comfort level of the students and it played a key role in the training and ultimately in the implementatng the Infor Visual ERP System. The training was interactive, hands- on, and at times collaborative. The trainees were always treated with dignity and respect. Often a Functional Flow, a detailed work process or procedure, was utilized for guiding the users. If an end user could not successfully follow the detailed directions to conclusion, modifications, clarifications or even re-writes were adopted to bring the user up to the speed. The users, being part of this process, became a strong supporter of the Visual ERP software and contributed to the success of the project and the company as a whole. Functional Flow documentation was available to all participants for training, refreshing what had been learned, and served as an excellent set of tools for future new hires.

The training game plan was to train all department managers so that they would then become the trainers for their staff and reports. The time line to "Go Live" was April 1 – a mere 6 months from the time the training was launched. The Infor Visual Quality module was used for tracking course completion, skills assessment, and qualification – the data required by the US Government. The training was exciting and challenging. Many managers embraced the new software enthusiastically, whereas a number of managers were negative and skeptical about the new software's value. Learning curves were different for different managers – some were fast learners and others (the skeptics) had to be led step by step with each of their objections being answered and overcome. As is true, once the skeptics become supporters of a program, it's on its way to a successful implementation.

Adding to the methodology used for a successful training program, the EPR manager describes: Early in the training of department managers we had short tests that we had developed from the Functional Flows and Visual documentation to judge our managers' performance and retention of key information. We scheduled one-on-one sessions with managers that had trouble on their tests. All managers were ready to present and train their reports before the last week of December. Consultants from Synergy also did assessments by departments to track readiness to achieve "Go-Live" target goal. The ERP manager and the Implementation Associate coached each manager before his presentation to his staff. They would always attend those presentations to help if the presenter had a problem to avoid any embarrassment with his staff/workers. Once this initial presentation/overview was completed they developed training for each employee based on his function. Each employee, again as individual, exhibited different learning style. Some were computer literate, others not. Some followed directions and the Functional Flow, others wanted to jump ahead of themselves or take shortcuts. Those who wanted to take shortcuts often ended up with problems – at that point we would "back up the bus" to get them on board reminding them the importance to "follow the flow" - the explicit instructions in each Functional Flow. In some classes even the instructor became 'stumped' – the Functional Flow did not work as presented. The students razzed us a bit but this became a learning exercise to solve the Functional Flow by using the Infor Visual ERP documentation. An added feature of the training program was to teach everyone the basics of Microsoft Office and hints and examples were distributed. Additional tips were added as training progressed.

Training took place daily in the Moose Lodge as the date to "go-live" was quickly approaching. A number of problems, however, developed before April 1. The readiness assessment conducted by the Synergy consultants suggested that the Finance Department as well as other areas needed more training. The top officials, CEO, CFO, and the ERP manager, agreed to move the "go-live" date to May 1. The extra time allowed further training to better prepare Finance Department in all of their Functional Flows, as well as to complete all the data migration and important IT functions. Diamond harvested all legacy system data elements (Excel) and were mapped appropriately into the Visual data base. Synergy took the data and loaded the Visual data base. Various reports confirmed that the data was mapped completely and accurately. More than 2000 hours were devoted to training on the ERP Visual Software prior to going live on May 1. The key deliverables and short and long range goals of the new ERP system were clearly identified as listed in sections that follow.

6.1 Key Deliverables

- Single data base (Quick Books, Access Quality) – Finance, Budgeting and Quality are fully integrated.
- Electronic interface to the CAD system (Solid Works) – critical to minimize the design to manufacture lead time and support customer delivery requirements.
- Lot Trace – needed to identify raw materials and components used in end items if a recall is needed to update or correct a product deficiency.
- Skills tracking – used Visual Quality to track training courses and credit employees with skills.

- Metrics – Financial performance, workforce training in Synoptix (Financials and Budgeting within Infor Visual).(see all Diamond Internal Data – Charts0

6.2 Expected Short Term Results
- No business interruption, met FY shipment goal.
- Granular single-source job/part costing.
- Finite scheduling integrated with robust MRP tool.
- Improved data accuracy – CAD-ERP-Financials.
- ERP system integrated with MS office

6.3 Expected Long Term Results
- Positioned for growth by using systems for management decision making.
- Proactive "what-if" capability to develop capacity and vendor selection.
- Root cause analysis for continuous improvement (Quality module)

7. *Lessons Learned*

From Diamond's experience it appears clear that training of the employees is the key to any successful transition from one system to another. Managers should document the training with functional flows, giving detailed directions of the process or procedure with computer screen shots. Test the trainees and undertake the qualification and readiness assessments for job performance as well as for government certifications or security clearances. Follow up with refresher courses to reinforce the positive practices and drive out the negative ones. Educate the workers so that they get the bigger picture and a broader perspective, and are motivated to participate in organizational efforts to upgrade its operations for improvements and to attain the corporate goals for growth, competitiveness, and sustainability. Update training as processes and procedures evolve or change.

7.1 Matrices for Continued Improvement

In the report Diamond Open PO $ by Product Code (4), the Purchasing Order (PO) highlights the areas that consume the bulk of PO dollar amount by Product code and helps Management and Purchasing to concentrate on areas of highest spending to ensure resources are monitored and controlled. The chart (5) highlights Diamond's Repair and Refurbishment load per month and helps management schedule repair business and to develop a strategy of allocating company resources (Labor hours, Engineering   and cash flow requirements). The Open PO $ by Due Date (6) shows open POs by $ per month and can be used by Quality (Active Rcvd insert) to judge load on the Quality Department, signaling where resources (time, personnel) need to be allocated. It can also be used the by Finance Department to determine the cash requirements. This report reflects the importance of accurate lead times, delivery requests and on time delivery by the Diamond suppliers.

In order to better control supplier performance, the purchasing manager has developed a PO On –Time- Report for analysis, review and action to insure that the vendor delivery performance is controlled and improved where needed. To develop excellent Supplier Relationship Management (SRM), where the company and the supplier are in productive relationship, the reports that measure Supplier Performance are critical. With the implementation of the new Infor Visual ERP system, Diamond's ERP manager realized the need to control documentation and reports. He issued instructions to the MT to outline a process of initializing and institutionalizing company reports (8).

7.2 Diamond's New Report Process

The ERP manager proposed a process to the Management Team to initialize and institutionalize reports to support business decisions. The process comprised of the following steps:
- End user to identify report/metric
- End user composes a brief statement of report's purpose.
- * Systems to develop prototype for end user review.
- * End user and system developer validate data.
- * End user and system developer validate all calculations.
- * End user "scrubs" all obsolete data.
- * Report team reviews the report.
- * Report team names the report.

> * End user determines frequency of report publication.
> * End user determines a report distribution list.
> * End user/system developer identifies distribution method.

7.3 Future Implementations

The future implementations involve Work flow – Vendor Portal – ECN Control. Managing the critical personnel and financial resources will help better prioritize Work In Process (WIP). The ECN control will document when changes are made and how they are incorporated on a timely basis. Purchasing will work with management to develop Vendor Portals with key suppliers to improve lead times and control costs associated with repeat and new buys.

8. Conclusion

The team at Diamond was successful in selecting and implementing a new ERP Software that has the functionality needed and integrates all functional departments within the company. Initial results and a review of reports developed show that Diamond is well on its way to continuous improvement by monitoring suppliers, quality, load on operations, and by documenting useful reports and measurements. The future study will examine Diamond's experience with Infor Visual ERP software and measure company's progress towards meeting its goal of growth of 30% by 2013 and its sustainability.
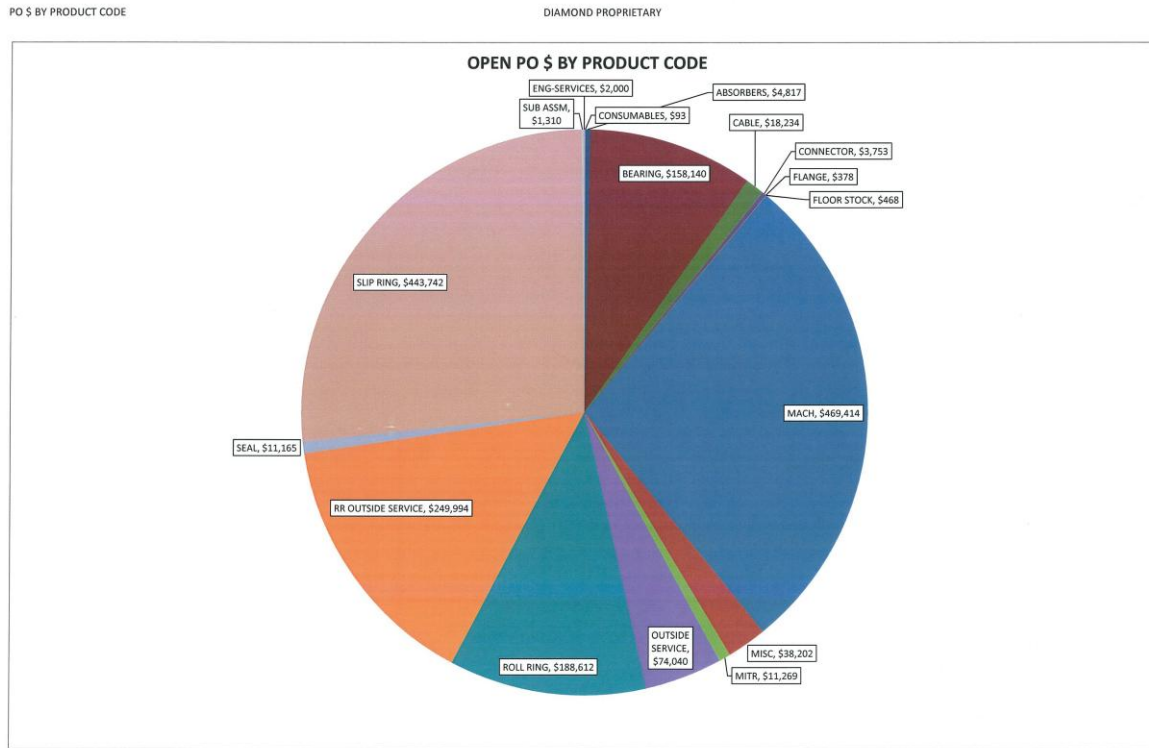
Sources of Diamond's internal data
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> * [Diamond Vendor Scoring Matrix.xlsx](#)
> * [Diamond Vendor Selection voting.docx](#)
> * Diamond Open PO $ by Product Code
> * Diamond Repair Load
> * Diamond Open PO by due Date
> * Diamond On Time Delivery Report
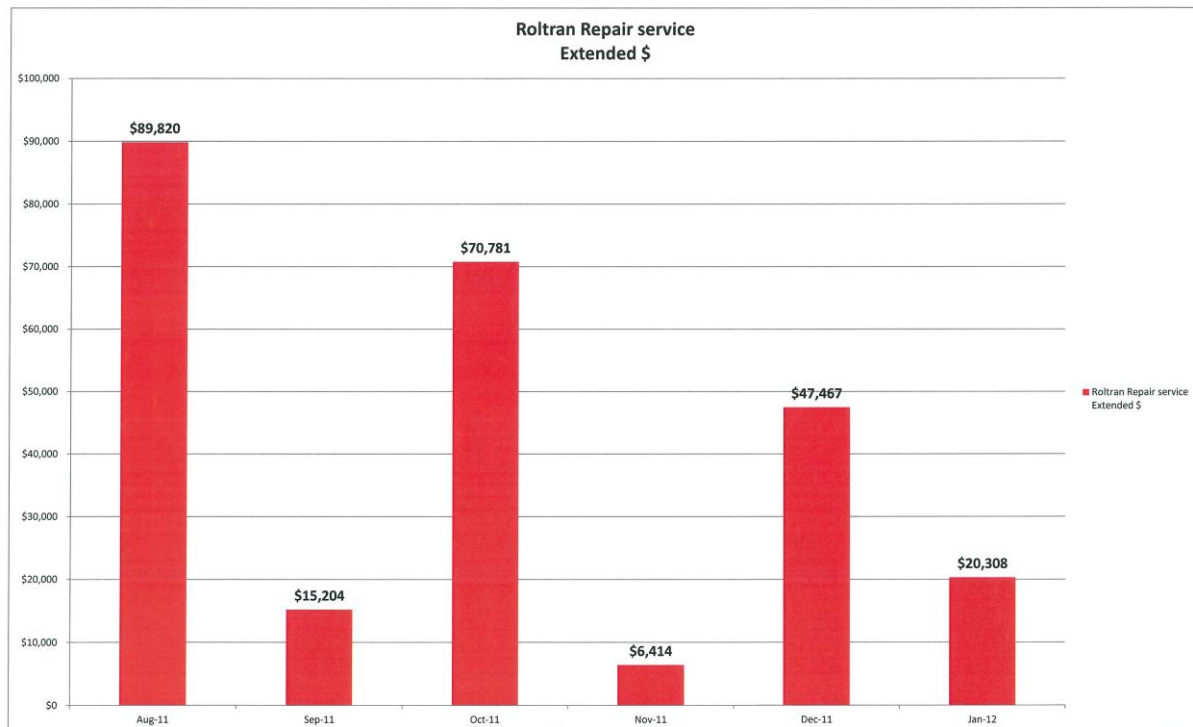> * Diamond New Report process e-mail

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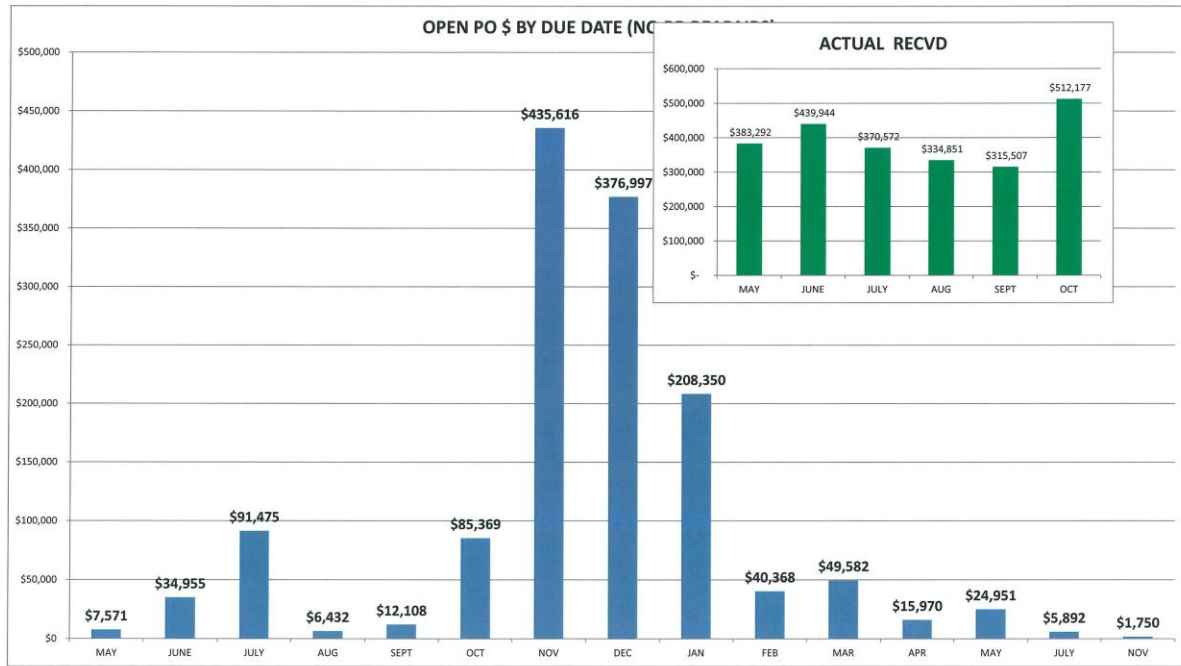
Diamond PO $ By Product Code.pdf

PO $ BY PRODUCT CODE   DIAMOND PROPRIETARY

OPEN PO $ BY PRODUCT CODE

ENG-SERVICES, $2,000
SUB ASSM, $1,310
CONSUMABLES, $93
ABSORBERS, $4,817
CABLE, $18,234
CONNECTOR, $3,753
FLANGE, $378
FLOOR STOCK, $468
BEARING, $158,140
SLIP RING, $443,742
MACH, $469,414
SEAL, $11,165
RR OUTSIDE SERVICE, $249,994
ROLL RING, $188,612
OUTSIDE SERVICE, $74,040
MITR, $11,269
MISC, $38,202

Diamond Monthly Repair Load in $s.pdf

Roltran Repair service
Extended $

$89,820
$70,781
$47,467
$15,204
$6,414
$20,308

Roltran Repair service Extended $

Aug-11   Sep-11   Oct-11   Nov-11   Dec-11   Jan-12

Diamond $ due by POs by Month.pdf

$ DUE ON POs BY MONTH　　　　　　　DIAMOND PROPRIETARY

Diamond Vendor On Time Report.xlsx open hyperlink to view