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Project Planning for Insourcing Manufactured Steel Components

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PROJECT PLANNING FOR INSOURCING MANUFACTURED STEEL COMPONENTS

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INTRODUCTION

Managers of manufacturing industries face ever more difficult business decisions. These decisions are magnified by the globalization of today's industry. Corporations no longer compete against one another nationally; rather, they are competing against foreign industries in a worldwide market. This increased level of competition has forced manufacturers to look for new ways to improve their business to remain cost competitive.

Many manufacturers are implementing lean manufacturing methodologies to decrease wastes in the organization. What are these wastes? Sullivan, McDonald, and Aken (2002) states, "there are seven types of wastes in organizations: overproduction, defects, unnecessary inventory, inappropriate processing, excessive transportation, waiting, and unnecessary motion". These wastes consume limited organizational resources such as people, machines, and material ultimately costing the manufacturer money. Inversely, any reduction in these wastes saves the manufacturer money, making it more competitive globally.

The intent of this project was to not only reduce the seven wastes, but to also lower the manufactured cost per part at a Midwestern agricultural equipment manufacturer.

Statement of Problem

The problem analyzed in this study is how to build a business case and project plan for insourcing a steel component part family at an agricultural manufacturer in the Midwest. The part family consists of three part numbers that were being produced outside of the organization, and are very similar to parts that are currently made internally. The supply management organization requested manufacturing to quote this work as a potential cost savings.

Reducing the overall cost of the product is essential to the organization remaining competitive in the global marketplace. Reducing the cost of the product allows the manufacturer to increase the margins on their products. The increased margins not only make the company more profitable, but also provide funds for future growth and expansion. However, failure to reduce costs weakens the company's ability to remain competitive with other equipment manufacturers. Increased costs will either erode margins or force the company to increase the cost of their product. If customers are not willing to pay for the cost increases the company may be forced out of business.

Statement of Purpose

The purpose of this study is to determine if a cost savings is attainable by producing a part family internally rather than purchasing the part family from an external source. The analysis not only addresses part cost, but also includes capital and expense investments required to tool up the factory to produce these parts.

This analysis will be presented to management to determine if the project plan is feasible from each of the following perspectives: cost (capital and expense), floor space, timeline, and resource availability. Each factor will be weighted by management to determine if the project will receive funding and move forward.

Statement of Need

The financial analysis is required to determine if a business case warrants the capital and expense investment to insource the part family. To the common eye, any cost savings should warrant the investment to insource the work. However, to the disciplined investor, specific project returns must be met to justify the expenditure and the time spent by internal resources on the project.

The return on investment (ROI) calculation will be used to evaluate each proposed scenario in this project. This is a necessary element of any project plan. A low ROI shows that the project may have savings, but the savings may not warrant the capital investment. A low ROI also shows that your money could be invested in other places to generate higher returns. Capital strapped organizations should focus on projects that generate them the largest returns.

Research Questions

The analysis seeks to answer four main questions about the project.

1. What is the project scope?
2. What are the capital needs of the project?

3. What is the ROI of the project?
4. Does the implementation timeline meet the needs of the customer?

These four questions are essential to management's decision framework. Management cannot determine the feasibility of the project without this information. An unfavorable answer to any of these questions may result in the project being rejected.

LITERATURE REVIEW

Scope

Prior to project work beginning project scope management must occur. According to Khan (2006), "project scope management can be broken into 5 components: project initiation, scope planning, scope definition, scope verification, and scope change control". The five components are crucial to defining the direction of the project.

Project initiation occurs from a business need. In most cases, teams are formed to address this need. Glassop (2002) states, "there are many benefits to using organizational teams, but the greatest benefit is a general improvement in work place performance".

This performance can be attributed to the different backgrounds and experiences each group member brings with them to the team. In the project initiation phase team members begin working through the project goals and the project's financial feasibility. Once these are defined the project can move onto the next phase, scope planning.

Project scope planning occurs after management has approved the preliminary project goals and feasibility analysis. Kahn (2006) defines the scope planning phase as, "a time when the project team begins adding more details to each of the project steps". Each phase of the project is broken down into smaller parts and a larger project plan begins to take shape. At this point, project team members are assigned to specific tasks to lead individually.

The third phase is scope definition. Kahn (2006) defines scope definition as, "a refined project plan that includes a defined budget, including contingency funds, and is the beginning of the project implementation". Without definition, a project can wonder far from its original goals. Dumont and Gibson (1997) state, "success during the detailed design, construction, and start up phases of a project are highly dependent upon the completeness of a project's scope". Teams putting in additional time upfront will prevent issues on the back end of the project. According to Dumont and Gibson (1997), "a 20 percent cost savings and a 39 percent schedule saving can be achieved by a high level of pre-project planning efforts". This is very significant savings especially when you figure the dollars and time spent on most large capital projects.

The fourth phase is scope verification. Koch (2006) defines this phase as, "the project team following up on the project work that is being performed". The project team members need to ensure work is performed to the standards that were set in the first three phases of the project plan. Payments can be made to contractors if the work has been completed to the proper standards.

The fifth and final phase is scope change control. Koch (2006) defines this phase as, “managing and limiting changes to the original project goals”. According to Koch (2006), “scope creep can assume horrendous proportions and may even force project cancellations”. Scope creep is especially present in large complex projects because so many items are intertwined. Items that were seen as small spin off projects can balloon into much larger projects and derail the main project.

Lean Manufacturing

Manufacturing strategy has changed dramatically over the past 50 years. During this time manufacturers evolved from batch and que production to a lean manufacturing system known as the Toyota Production System (TPS). According to Sullivan et al. (2002), “the Toyota Production System is defined by these principles: flexibility, waste elimination, optimization, process control, and people utilization”. However, in more recent years Hicks (2007) defined lean manufacturing as having five key characteristics:

1. Specify value – define what the customer sees as value
2. Identify waste streams – identify entire value stream for product family
3. Make value flow – increase efficiency after waste is removed
4. Let the customer pull value – provide an end product for the customer when the customer wants it
5. Pursue perfection – continue to eliminate wastes in processes

Both sets of principles define how manufacturing operations need to run in today's climate to remain competitive. However, how are these principles implemented on the shop floor to have the greatest effects? According to Agarwal and Sarkis (1998), "there are two predominate methodologies for setting up manufacturing layouts: functional layouts and cellular manufacturing layouts". Traditionally, functional layouts, standalone machines, have been used in manufacturing operations. However, in recent years, cellular manufacturing has taken over as a way to reduce inefficiencies. Cellular manufacturing allows one operator to run several dissimilar machines at one time. The idea is to produce parts complete in one cell rather than transferring parts from one machine to another. Bazargan-Lari (1999) states, "this significantly improves set up times, reduces work in process (WIP), improves quality, raises employee satisfaction, and shortens lead times". Also, the positive effects of cellular manufacturing can often be implemented with minimal capital investment due to the fact existing machines can be relocated to form a cell from other areas inside the factory.

An efficient cell layout is essential to fully gain the positive effects of cellular manufacturing. The cell must be engineered to accommodate part flow from one machine to another. Also, travel distances between machines, gauges, and incoming/outgoing materials must be limited. Bazargan-Lari (1998) warns, "existing layout models normally generate a single take it or leave it design where the traveling cost is the sole criteria for decision maker". Engineers need to look beyond this factor and ensure the layout is still flexible enough for other products to come into the cell down the road.

Machine tool decisions have also changed drastically with cellular manufacturing methodologies. Large, inflexible, high volume machines have been replaced with smaller multifunctional machines. According to Sullivan, McDonald, and Van Aken (2002), "this has not only reduced the floor space required for this equipment, but also reduced the high capital investments for these types of processes". Also, the flexibility of the new machine tools allows factories to quickly change from one product to another. This is especially important when volumes fall. For example, inflexible machines will sit idle when production volumes fall for products ran across them. However, in the same scenario, flexible machines allow for additional work to be transferred to them thus increasing their utilization.

The machine manufacturers continue to press the envelopes for manufacturing technology. Their latest innovations for flexible machines can found in the new multi-task machines. Multi-task machines are machines capable of performing many operations in one machine. This includes machines capable of performing turning operations, milling operations, and gear cutting operations in one work center. According to Lorinz (2011), "multi-task machines offer faster production by improving throughput, minimizing set up time, eliminating part handling and secondary operations, and reducing cycle times". These machines also improve quality by machining parts complete in one operation. This eliminates locating errors between operations which can cause parts to be out of specifications. Unfortunately, this technology requires a large capital investment. Manufacturers need to perform an in depth analysis to determine if the benefits outweigh the upfront costs of the technology.

Return on Investment (ROI)

Manufacturing organizations have ever increasing capital project needs to replace existing equipment, fund future growth, and pursue efficiency improvements. Unfortunately, every organization faces capital funding constraints limiting their ability to pursue capital projects. In response to these funding constraints, organizations have financial metrics in place to determine which projects will receive funding. According to Meredith and Suresh (1986), "the overwhelming majority (91%) of firms use payback and ROI methods for economic justifications".

ROI calculation:

$$B = X/Z \quad (1)$$

$$ROI = B/Y \quad (2)$$

B = Average annual benefit of the project

X = Average annual benefit

Y = Total investment

Z = Number of payback years

ROI is needed to determine not only the payback on one specific project, but it is also used as a consistent measure to evaluate all of a corporation's projects. This allows manufacturing organizations to focus their constrained capital budgets on projects that will generate the highest returns.

However, it should be noted that there are opponents to the conventional financial analysis tools. Alkaraan and Northcott write, "conventional models tend to be biased towards the short term, less strategic investments whose benefits are most easily quantifiable". Long term investments are more difficult to evaluate due to their complexity. There are generally more factors to evaluate, and often these factors are estimates. Some factors are estimated high and others are estimated low. It is especially difficult to put dollar figures on projects that hold strategic implications. For example, an investment may be made to increase competition at a different region around the world. The initial return may not be there, but the business could grow.

RESEARCH METHOD

This study used a cost analysis research method to evaluate manufacturing scenarios against competitor's part pricing. Multiple requests for quotes were sent to competitors on a family of parts. During this same time period internal team members also reviewed the part family and gathered manufacturing cost information. Justification for this project was built from the difference in prices between the cheapest competitor and the internal team.

After the internal team calculated the savings between their price and the competitor's price they built a project justification. All capital equipment needs and expense monies required to insource the part family were included in the project justification. An ROIwas calculated by the internal team and the project was sent on for management's review.

DATA ANALYSES

Prior to work beginning on the project an internal team met to review management's request and determine an overall direction. The initial meeting was with the manufacturing engineer (M.E.), who oversees production of a similar part family, and the project manager for the building. Management's overall goal was to pursue insourcing the parts if the team could fit the parts into the business and meet the delivery schedule. Those two items were defined as the overall project scope.

After the initial kick off meeting the M.E. and the project manager began brainstorming possible solutions for the project. The team envisioned three scenarios that each required significantly different capital investments. The first option, lowest cost, was insourcing the parts and running them on existing equipment that was already tooled for very similar parts. The second option, medium priced, was insourcing the parts and piecing together a new cell made of existing equipment from throughout the factory. The third option, highest cost, was insourcing the parts and purchasing new equipment to make a new cell. Each of these scenarios will be broken down and analyzed in more detail.

First Option (Low Cost)

As mentioned above, the easiest and lowest cost solution was running the parts on an existing cell that was producing parts of very similar geometries. The cell was tooled up as two lathes, a vertical machining center, and a deburring machine.

This solution did not require any significant capital investment or process development to bring the work in house. Figure 1 summarizes the part cost savings of machining the parts internally on the current equipment versus two external suppliers.

			Inside vs. Supplier A		Inside vs. Supplier B
P/N	Capacity Volume	Cost difference per part	Savings	Difference	Savings
Part A	1,200	$ 23.15	$ 27,778.73	$ 8.33	$ 9,994.73
Part B	12,000	$ 39.52	$ 474,186.94	$ 8.55	$ 102,546.94
			$ 501,965.67		**$ 112,541.67**

Figure 1 Option One – Part cost savings for manufacturing part A and B internally versus two outside suppliers.

Machining the parts internally is $501,000 cheaper than Supplier A and $112,000 cheaper than supplier B. Since no investment is required, the ROI for this scenario cannot be computed using the conventional equation. However, if no investment is required to save the company $112,541 per year the obvious answer is to move forward with the project. This solution was proposed to the operations team for the area. Although the team liked the proposal they requested additional capacity information prior to agreeing to bring the work in house. Figure 2 summarizes the hours per day each part runs on the cell. Part numbers C through M currently run on the cell and have similar geometries to the parts that were reviewed for insourcing. Part numbers A and B are the parts the team reviewed to insource.

Part numbers C through M accounted for 13.89 hours of work routed across these machines per day prior to part numbers A and B being added to the cell. However, the hours per day ballooned to 25.97 hours after parts A and B were added to the machines.

Part Number	Annual Qty	Hours/100	Annual Hrs	Hrs /Day
A	1,600	16.2	259	1.08
B	16,000	16.5	2640	11.00
C	6,857	15.2	1042	4.34
D	113	14.4	16	0.07
E	6,649	13.3	884	3.68
F	1,646	15.2	250	1.04
G	0	18.2	0	0.00
H	1,425	13.1	187	0.78
I	1,546	15.3	237	0.99
J	1,035	10.2	106	0.44
K	465	15	70	0.29
L	3,057	12.6	385	1.60
M	955	16.5	158	0.66
			Current	13.89
			Current + Insource	25.97

Figure 2 Option One – Capacity analysis of the turning cell with the current parts and insourced parts.

Unfortunately, this was found to be impractical for a cell that can only run 24 hours per day, and consisted of equipment with an average age of 15 years or more in production. Management recognized that the cell would be required to run every Saturday and Sunday to meet the additional production requirements. This would put the business at significant risk if a machine broke down for any length of time because there would be no way to make up the loss of production. The decision was made that the business risk was too great to take on the work on the existing equipment.

Second Option (Medium Cost)

The second option reviewed by the team was insourcing the parts on a new cell made up of existing equipment in the factory. The parts would be produced in identical fashion to option one, and generate the same amount of savings per part as shown in figure 1. Also, the new cell would allow the hours per part per day to be split evenly between the existing cell discussed in option one and the new cell in option two. Figure 3 summarizes the hours per day for each part ran against the old cell and the new cell.

Cell	Part Number	Annual Qty	Hours/100	Annual Hrs	Hrs /Day
New	A	1,600	16.2	259	1.08
New	B	16,000	16.5	2640	11.00
Total				**2899**	**12.08**
Existing	C	6,857	15.2	1042	4.34
Existing	D	113	14.4	16	0.07
Existing	E	6,649	13.3	884	3.68
Existing	F	1,646	15.2	250	1.04
Existing	G	0	18.2	0	0.00
Existing	H	1,425	13.1	187	0.78
Existing	I	1,546	15.3	237	0.99
Existing	J	1,035	10.2	106	0.44
Existing	K	465	15	70	0.29
Existing	L	3,057	12.6	385	1.60
Existing	M	955	16.5	158	0.66
Total				**3334**	**13.89**

Figure 3 Option Two – Capacity analysis of insourcing the parts on a new cell and keeping the existing parts on the old cell. This evenly split the hours between two cells.

However, option two would require freeing up existing machines, finding a place to put the new cell, and ordering new tooling for the machines. Each of these complexities will be reviewed below.

The team began by reviewing which types of machines would be required to produce the parts. It was determined that the parts would be processed in the same fashion as option one. This required two horizontal lathes, a vertical machining center, and a deburring machine. The team then reviewed which machines could easily become available. The two lathes would be repurposed from a hard finishing department, the vertical machining center would have parts routed off of it and freed up from the existing department, and the deburring machine would come from storage.

Once the equipment was identified, the team needed to find a location to place the cell in the building. This was very problematic as the building was currently full of equipment. Existing equipment would need to be relocated and condensed to make room for the new cell. Additional people were added to the team to participate in these conversations because the moves affected other departments. As the team grew in size so did the scope of the project. Each additional person had specific items they wanted for their departmental area.

When the plan was finalized it called for moving 10 machines and 8 bridge/jib cranes. Figure 4 summarizes the costs associated with moving each of these assets. This came at a substantial cost, but it did provide layout benefits for two departments. The new cell would be located next to the cell that was producing the part family very similar to the parts the team was trying to insource. This required a cell to be relocated in the neighboring department. The neighboring department would have the opportunity to place two cells next to one another that were also running identical parts.

Machine Moves for Department X and Department Y

Department X	Qty	Cost	Total
Vertical Mill	1	$ 15,000	$ 15,000
Lathe	1	$ 15,000	$ 15,000
Lathe	1	$ 15,000	$ 15,000
Deburr	1	$ 15,000	$ 15,000
Department Y			
Press	1	$ 20,000	$ 20,000
Lathe - optional	1	$ 49,000	$ 49,000
Lathe - optional	1	$ -	$ -
Vertical Mill - optional	1	$ -	$ -
Vertical Mill - optional	1	$ -	$ -
Mill and center	1	$ 25,000	$ 25,000
JIB/Bridge Removal			
1 Bridge - optional	1	$ 5,000	$ 5,000
3 JIB	3	$ 2,000	$ 6,000
JIB/Bridge Installs			
1 bridges -optional	1	$ 20,000	$ 20,000
3 JIB's	3	$ 10,000	$ 30,000
-			
Total			$ 215,000

Figure 4 Option Two – Machine move costs for each asset. The total cost includes hiring contractors on a time and material basis to perform machine rigging, electrical disconnect and reconnect, iron/weld work, and structural design costs.

The third complexity to this plan was the additional tooling and machine hardware required for the new cell. As mentioned above, the lathes were used in hard turning operations and did not run coolant. Coolant would be required in the pre heat treatment turning operations. Unfortunately, the machines were not purchased with coolant pumps or plumbing to the turret so this hardware would need to be purchased and installed. Also, the chucks that were on the lathes would not work for the parts the team was trying to insource.

The lathes ran 3 jaw chucks in the hard finishing department, but the insourced parts require a 2 jaw chuck. These two modifications would require an additional $150,000 capital investment. Figure 5 summarizes the total investment and annual cost savings for option two.

Summary of required expediture and cost savings for in-sourcing						
Department	Machine Capital	Tooling Capital	Perishable Tooling	Expense	Machine Moves	Comments
Pre-heat treatment turning operations		$ 42,000				**Gages and Workholding:** Rgh & Fin Jaws, Haas fixture & collets, Bore gages w/masters, Snap gages w/masters, hole/slot relation gage, thumbnail gages, height blocks, Broach fixture, Broach spline/slot relation gages, granite plate
Pre-heat treatment turning operations	-		$ 10,000			2 Broach Bars
Pre-heat treatment turning operations		$ 45,000				(2) 2-Jaw and (1) 3-Jaw SMW Chuck
Pre-heat treatment turning operations					$ 60,000	**Machines Moves:** 102175 6886 6895 6447
Pre-heat treatment turning operations		$ 26,500				**Peripheral Items:** Cabinets, Tilt Tubs, Telesis Unit, Bench Center
Pre-heat treatment turning operations	$ 110,000					Convert 6886 and 6895 to coolant & OLS modifications
Pre-heat treatment turning operations		$ 34,000				**Tool up Machines/Fixtures:** Tool up lathes, Tool up 102175/141783, Fixture for 102175/141785, duplicate tooling
Pre-heat treatment turning operations		$ 5,000				Tooling for pinion gear
Heat Treat		$ 9,000				Coils: 2 @ $3,200 ea. plus $450 design cost Holders: 2 @ $500 ea. Plus $200 design cost
Hard finishing operations		$ 22,000				ID clamping Collet, Master Ring, Splined Bushing
Machine Moves					$ 45,000	**Required Machine Moves:**
Machine Moves				$ 69,000		**Optional Machine Moves/Bridge Removal and Install:**
Machine Moves				$ 6,000		**JIB Removal:** 3
Machine Moves				$ 30,000		**JIB Installs:** 3

Totals	
Capital Costs	$ 293,500
Perishable	$ 10,000
Expense	$ 210,000

Expediture Required	$ 513,500

Annual Cost Savings	$ 112,542

Figure 5 – Investment Analysis

The annual cost savings are taken from figure 1 and are identical between insourcing option 1 and option 2. The reason for this is found in how the team planned to manufacture the parts. Machining operations will be identical for options 1 and 2.

Based on the figures above and using *Equation 2,* the ROI is calculated as follows for the project:

ROI: ($112,542 - $513,500)/$513,500 = .78

1-.78 = .22

The ROI for the project is approximately 22 percent.

Third Option (High Cost)

The third option reviewed by the team was insourcing the parts and purchasing new equipment to manufacture the pre-heat treatment machined geometries in one operation. The team reviewed many options, but decided a multitasking machine would be a great fit for the part family. The machine could perform the turning, milling, drilling, and tapping operations in one machine. This would also improve the quality by machining the part geometry in 2 clamp stations instead of 4. Also, the multitasking machine would have fully automated part handling. The operator would only need to touch the parts twice; loading raw parts and unloading finished parts from a carousel conveyor. This reduced the operator handling from 6 touches to 2, and allowed the team to lower the cost estimates for the parts based on less work for the operators. However, multitasking machines require a significant investment. Figure 6 outlines the cost breakdown for a multitasking machine including tooling, forging modifications, and machine relocations. This project would have would have required $1.25 million.

Multitasking Machine for Random Service				
Capital Cost	Perishable Tooling		Expense	Comments
$ 1,200,000.00				2011 prices includes machine installed, w/ workholding, and programming. Deburr machine
$ 20,000.00				Forging Die to reduce draft on small hub
			$ 30,000.00	Move Machine 123124 and Mag booth?

Figure 6 Option Three – Multitasking Machine Costs

Figure 7 summarizes the part cost savings of machining the parts internally on the multitasking machine versus two external suppliers.

		Inside vs. Supplier A		Inside vs. Supplier B	
P/N	Capacity Volume	Cost Difference per Part	Savings	Cost Difference per Part	Savings
A	1,200	$ 30.82	$ 36,988.73	$ 16.00	$ 19,204.73
B	12,000	$ 47.43	$ 569,156.62	$ 16.46	$ 197,516.62
			$ 606,145.35		**$ 216,721.35**

Figure 7 Option Three – Part cost savings for manufacturing part A and B internally versus two outside suppliers.

Based on the figures above and using *Equation 2*, the ROI is calculated as follows for the project:

ROI: ($216,721 - $1,250,000)/$1,250,000 = .82

1-.82 = .18

The ROI for the project is approximately 18 percent.

CONCLUSION

The team reviewed three proposals for insourcing the parts: option one manufacturing them on a current cell, option two manufacturing them on new cell identical to the current cell, and option three manufacturing them on a multitasking machine. Option one was the cheapest solution but did not have enough manufacturing capacity to meet the volumes required. Option two was the medium cost solution requiring a new cell to be installed that would produce the parts in the same fashion as option one. Option three was the highest cost solution requiring a new machine to be purchased and installed. However, it saved the company the most money per part.

After reviewing the solutions the team decided to pursue option two, the medium cost approach. This option provided ample turning capacity with the lowest capital cost and highest ROI. A timeline for the project was formed and can be reviewed in Appendix A. The project needed to be completed within a short time window. If the team could not complete the project by September of 2014 the project needed to be scrapped. According to appendix A, the team determined the project needed to begin in February 2014 and could be completed by August of 2014.

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APPENDIX A

OPTION TWO – INSOURCING TIMELINE

Task Name	Duration	Start	Finish
Design jib for 2955	2 wks	Mon 2/10/14	Fri 2/21/14
Design jib for 2955	2 wks	Mon 2/24/14	Fri 3/7/14
Build Draft shaft bank	50 days	Mon 3/3/14	Fri 5/9/14
Move 2955	3 wks	Mon 3/3/14	Fri 3/21/14
Chucks for 6886 & 6895	10 wks	Mon 3/3/14	Fri 5/9/14
Top tooling for 6886 & 6895	16 wks	Mon 3/3/14	Fri 6/20/14
YZ yoke gages for green operations	16 wks	Mon 3/3/14	Fri 6/20/14
Fixture for 102175	16 wks	Mon 3/3/14	Fri 6/20/14
Fixture for R337624 & R237389 on 141783	16 wks	Mon 3/3/14	Fri 6/20/14
Move R301574 to D427	80 days	Mon 3/3/14	Fri 6/20/14
Design bridge for B108133	2 wks	Mon 3/10/14	Fri 3/21/14
Move jib ??? For 2955	1 wk	Mon 3/10/14	Fri 3/14/14
Move jib ??? For 2955	1 wk	Mon 3/10/14	Fri 3/14/14
Design jib for 9142	2 wks	Mon 3/10/14	Fri 3/21/14
Perishable tooling for 6886 & 6895	8 wks	Mon 3/10/14	Fri 5/2/14
Perishable tooling for 102175	8 wks	Mon 3/10/14	Fri 5/2/14
Perishable Tooling for R337624 & R237389 on 141783	8 wks	Mon 3/10/14	Fri 5/2/14
Move 9142	2 wks	Mon 3/17/14	Fri 3/28/14
Move jib ??? For 9142	1 wk	Mon 3/24/14	Fri 3/28/14
Install bridge for B108133	2 wks	Mon 3/31/14	Fri 4/11/14
Move 108133, 108135, 3517, 104899	3 wks	Mon 5/12/14	Fri 5/30/14
Move 102175	2 wks	Mon 6/23/14	Fri 7/4/14
Move 6447	2 wks	Mon 6/30/14	Fri 7/11/14
Move 6886 & 6895	3 wks	Mon 7/7/14	Fri 7/25/14
Install chucks for 6886 & 6895	1 wk	Mon 7/28/14	Fri 8/1/14
Add coolant to 6886 & 6895	2 wks	Mon 8/4/14	Fri 8/15/14