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Capital Equipment Procurement Process and Integration Into Production

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This paper defines roles and responsibilities for personnel while purchasing capital machine equipment to integrate into production to make machined components to be used in assembly operations. This paper, along with internal support documents the necessary tasks to be completed to ensure the project's success while maintaining delivery, cost, and the quality of product is preserved. Once a project charter is accepted, roles and responsibilities to support groups are assigned. Roles & responsibilities are established to ensure proper knowledge of machine purchase prior to the purchase order being release. This allows all organizations to input their requirements to ensure delivery dates are met, along with ownership of each task. This eliminate confusion and frustration that has previously been exhibited due to lack of communication/ knowledge of equipment purchases. By following the new procedure, projects will remain on schedule, on budget, and with the quality expected to hold.

CAPITAL EQUIPMENT PROCUREMENT PROCESS AND INTEGRATION INTO PRODUCTION

A Graduate Research/ Project Proposal
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In Partial Fulfillment of the Requirements
for the
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by
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Abstract

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CHAPTER 1: INTRODUCTION

Introduction

Capital purchase agreements for machine acquisition is not a new process, however the process is ever growing in complexity. With advancements in machinery technology and automation requirements in the fast-paced manufacturing world, knowing who, what, and when to involve responsible parties has become a problem. By understanding the process from when the setup of manufacturing cells is first discussed to when it is completely integrated, many tasks and discussions need to evolve prior. This project breakdowns the understanding of whose task is at hand and when their assistance is required, along with tools needed to support future machine cells.

Statement of Problem

The problem to be addressed in this project report is understanding who, what type, and when resources are required during a new computer numerical control (CNC) machine cell integration. Establishing these resources ensures quality of parts, delivery timelines, and maintaining a budget for the assets.

Statement of Purpose

The purpose of this project is to create a checklist of requirements to implement a capital equipment purchase. This checklist will include details as to whom should be assigned what job functions and how to communicate these assignments. In turn, the checklist will ensure all parties are aware of their responsibilities and how to effectively and efficiently execute their tasks. Giving assigned job functions to appropriate personnel will help to ensure the project stays on schedule and on budget.

Statement of Need

The justification of this project is the need for large capital investment projects to meet all deadlines, budgets, and while still maintaining the quality of product expected by customers. Not having the required resources notified of when assets are coming into the facility, communicating the ever-changing requirements is not acceptable and can be costly. Just because one area of the organization agrees the asset is correct, does not mean it meets the entire organizations requirements. Project managers may create their own checklist for just one area of the process, limiting the effectiveness of the entire process. Different checklists may not be easily accessible as they may only be found in the possession of the individual who created and is utilizing that particular check list. Others may not be aware of the various checklists and have to reach out to individuals involved in different projects to see if they even exist. By having one checklist from the time a Request for Quote (RFQ) is sent out to start of production, the overall process will run a lot smoother and eliminate headaches and missed opportunities.

Questions to be Answered

Why is it critical to have one overall checklist when purchasing capital equipment?

Whose signatures & when are signatures required to make acknowledgement and sign off on the purchasing of an asset?

Assumptions – Requirements

The purpose of this project report is to create a "check off checklist" detailing requirements when procuring a manufacturing cell, and to ensure all parties involved understand and can effectively communicative in a timely matter. A checklist will star for the following phases, request for information, request for quote, capital purchase agreements, machine procurement, and machine install stages of projects. The following support groups will know when and what their roles will be; environmental, ergonomics, safety, operations, supply management, maintenance, Computer Numeric Controls (CNC) programming, factory automation, Information Technology (IT), facilities, scheduling, and manufacturing engineering. By knowing who to involve when, and how in-depth each task is, this will create a better aligned team to ensure quality work is done and production dates are met for new cell developments.

By understanding the capital purchase agreement guidelines and process, the effectiveness of each individual on the team will grow. An overall guideline when purchasing equipment is to ensure no support groups are excluded from knowledge of purchase that could compromise the deadline for production. A checklist indicating the overall flow of requirements to be met, along with a diagram showing how and when each member of the team is expected to perform their actionable task will be required. Also listed will be the deliverables at the beginning and end of each stage of the project. The worksheet will be created as a timeline and include detailed instruction of all tasks needed to make the project a success; with on time delivery and with no or limited unexpected occurrences. The overall project will then be presented on a SharePoint site.

CHAPTER 2: REVIEW OF LITERATURE

Literature Review

The need or requirement of an investigation capital equipment procurement process and integration into production facility is critical for a successful machine procurement project. Failure to inform all parties involved, clear direction, and plan thoroughly will result in cost overages, delays, and protentional of project failure.

Poor project planning can become very costly. In a recent Information Technology (IT) survey, the three primary reasons projects failed were due to poor planning and poor management (77%), change in business direction (75%), and lack of business management support (73%) (Garg, 2010). Without a thought-out plan of expectation, requirements, and results, projects are set up for failure. Full commitment from management for resources and funding is required to ensure the project will be successful.

To ensure projects are valid, a project charter is recommended. The charter statement sets clear directive to what is being done, roles and responsibilities, stakeholders, and project managers authority on the project. Many projects have failed to complete the project due to numerous issues, however, "inadequate resources, poor user involvement, users' resistance to change, high attrition rate of project team members, lack of top management commitment, poor project management, inadequate project team composition, ineffective organizational change management and unrealistic project scheduling are the most common for I.T." (Garg, 2013). By ensuring the

project charter is complete with all individuals and management approval, the project will be set for success.

Clear communication upfront and throughout the project is essential to making the project a success. Many times, miscommunications will cause confusion and may delay the completion of the project. Three main factors that impact the overall success of the project are; communication, trust, and confidence (joint risk management). Of the three factors with the largest impact, communication was identified as the most prompting factor impacting the success of the project. Mutually inclusive, trust and confidence were found to have direct correlation to the project managers communication of actions required and dates to be met (Doloi, 2009).

Communication is the foundation of project management with multiple cornerstones supporting the role. To have a successful project, communication with all individuals involved in the project is the most important skill with the largest impact. Failure to communicate correctly will result in the cornerstones of the project failing, resulting in cost, scope, time and quality delays. The interrelationship of these areas all rely on individuals successfully completing their task at hand, and by resulting in clear communication will all parties (Zukch, 2014).

The project complexity is ever growing and changing as the project progresses, however the measurement and goals still need to be achieved. The decision-making ability of the project manager needs to be able to adapt as the project grows, adapting to the project complexity. Project complexity can be evaluated and scaled to ensure the

project stays on track. By evaluating the current progress verse perceived plan, the scale can be used to determine where the project is currently at and will milestones be met on time. (Vidal, Marle, Bocquet, 2011).

Even with thorough planning and commitments, projects uncertainties will arise. Having a defined detail-oriented schedule may minimize disruptions, however during execution of the project, problems will occur. These disruptions can be minimized by a robust project scheduling, built in by effective and well-organized proactive approach. By scheduling problematic timelines with detailed charter, along with all organizations aligned to ensure dates are met, disruptions can be minimized. The robust project schedule needs to be reviewed weekly to ensure the schedules stays on track. By proactive and reactive scheduling procedures, disruptions will be limited to ensure all parties are meeting requirements (Demeulemeester, Herroelen, 2011).

Resource Constrained Project Scheduling Problem (RCPSP) is a common theme among project managers. Being able to achieve deadlines, with limitations of precedence and resource constrains is difficult. By detailing schedule requirements with resources required and the duration needed, limitation is relieved. RCPSP can be broken down into classifications of job requirements and flow of process. The RCPSP tool allows you to set limitation on time and work requirements to minimize disruptions and timelines through the process (Hartmann, Briskorn, 2010)

The ability to have individual experts in the field they are providing for work has become generally scarce and costly. The ability to control staffing during a project

depends upon the schedule requirements, therefore allowing the project team to offset the individual experts for non-scarce human resources. This alternative approach for scheduling resources during the planning phases of the project reduces the overall cost, and the impact one individual may have on the project. By enabling a team of workers to benchmark other projects prior to starting their new venture, the team can collaborate on best practices. The way things have always been done, may not be true now. As the world evolves, techniques and procedures need to keep up with the demand. By insuring the team works together as one, the project will become successful (Laslo, 2010).

In recent years, resources have become a scarcity, resulting in project constrains and delays with compounding issues. Multiple techniques are used to reduce this dependency, Program Evaluation and Review (PERT) and Critical Path Analysis (CPM) are widely used. By using tools such as Microsoft Projects, minimization of resource constraints can be seen from a high level, prior to fine detail analyzing. The ability to use project software evaluates the effectiveness and resources used to ensure projects remain on schedule with resources to maintain schedule requirements (Kastor, Sirakoulis, 2009).

Once milestones of the project are finished, evaluation of one's self and building on past experiences is essential. Using Building Information Models (BIM) helps elevate issues on the next project that were not foreseen on the current project. While using BIM, it's essential to write about experiences/ lessons learned as they are happening to help ease the stress on the next project you're involved in. By learning from past experiences and lessons learned, delays that were costly can we dramatically reduced if recorded. Most times tribal knowledge is pasted on through time, but items are left out. By having

tools that allow all individuals of the group to use, projects become more efficient and less costly (Peterson, Hartmann, Fruchter, Fisher, 2011).

Definition of Terms

Benchmark – A measurement of quality of an organization's policies, products, programs, strategies, etc., and their comparison with standard measurements, or similar measurements of its peers (Business Dictionary, 2019).

Building Information Models (BIM) – Online network modeling system tool to help plan, design, and construct buildings to be used during decision making process (Peterson, Hartmann, Fruchter, Fisher, 2011).

Capital Equipment – Equipment grader than $25,000 requiring a authorization for expenditures to purchase equipment. Dependent upon value, additional signatures are need up to President of company.

Critical Path Analysis (CPM) – Process of charting out the longest distance of a project, using tools to measure completion time (Kastor, Sirakoulis, 2009).

Microsoft Projects – Microsoft product used to report projects status. A master scheduler's database with elements of real time, planning, scheduling, resource, resourse constraints, and task list (Kastor, Sirakoulis, 2009).

Program Evaluation Review Technique (PERT) - Statistical tool used to manage projects in relation to time, while analyzing the task at hand. Being able to break down

each task and determine the amount of time required, therefore finding the longest duration of time to the critical path (Kastor, Sirakoulis, 2009).

Project Charter – A laid out document stating ta project exist. Provides milestones, team, timeline, requirements, and expected results, along with approval to commence the project (Garg, 2013).

Resource Constrained Project Scheduling Problem (RCPSP) – Consists of activities that must be scheduled subject to precedence and resource constraints such that the make span is minimized (Hartmann, Briskorn, 2010).

CHAPTER 3: METHOD OF STUDY

Understanding the entire process of capital equipment procurement is critical for a successfully project. Determining initial necessary phases, listing out each action with deliverables and personnel responsible for each step was the next phase. After gathering knowledge from the literature review; best practices, research questions, and a survey (Appendix A) was established to assess current knowledge and understanding of the capital machine acquisition process.

Participants

The participants selected for this study come from a broad range of manufacturing backgrounds with experience related to machine acquisition. The ten participants consisted of eight males and two females. Of the eight males, knowledge and experience ranged from two years to twelve years, while the two females had one and four years of experience. All survey answers were anonymous and voluntary, solely used for determining how the current process in a large organization is complex and can be difficult to see from start to finish perspective.

Materials

The survey itself consisted of nine questions related to current knowledge and ownership of different phases in the capital acquisition process. The questions came from prior experience and ideas from the literature review. The questions used in the survey can be found in (Appendix A). Questions asked were of a broad range, due to the fact that those being questioned came from varying parts of the organization. Results obtained reflect the complexity of the purchasing process.

CHAPTER 4: ANALYSIS AND RESULTS

Analyzing the milestones of equipment purchase and then assigning roles to each designated department with clear definition is required. By understanding what each fragment's role/ responsibility is, it becomes easier for a group to accept responsibility by leading or supporting. A large portion of this project was meeting with managers to agree upon each responsible party's acceptance of supporting, leading, or approving. Shown below are milestones and fragments of the capital acquisition process.

Project Charter – First discussion of project to determine the existents of the project and authority for the work to begin.

Request of Information – Specifies of machine requirements to be met, along with the needs and wants of purchasing the new machine. Information sent to multiple suppliers to allow them to inform us of what machines they recommend and an estimated cost of the recommended machine.

Benchmarking – Visiting suppliers to compare and rate their ability to perform required tasks against our current capabilities. This is done to reassure and/ or change the way we manufacture components.

Request for Quote – Formal quote request from supplier along with quoting package. Package includes all requirements of machine, along with standards that must be met, non-disclosure agreements.

Decision Analysis – Rating/ weighing of suppliers provided information in a competitive layout. Laying out requirements and wishes, assigning weight/ points to each topic and

assigning values from each machine supplier based upon quote information, (note: follow up with supplier may be needed to gather future detailed information.)

Risk Analysis – Rating of suppliers based upon several factors including: machine uptime, stocked replacement parts, longevity of supplier, prior history of company, and response time of machine downtime.

Process Development – With new machines/ equipment, developing a process to ensure our new procedure will achieve the required results per capital purchase agreement (CPA). Many times, the process of manufacturing a product will change, ensuring the new process takes many attempts and very in duration in time.

Value Stream Mapping – Understanding the process flow and analyze machine cycle times & distances to reduce bottle necks and increase machine utilization.

Project Schedule – Communication with supplier from the date the Capital Purchase Agreement is signed. Weekly telephone conferences to discuss machine status and sign-off agreements of the following: machine layout, footprint, fixturing, tooling, and part layout.

Banks- Banking up material or creating additional material orders to drive additional forgings &/or bar stock to be used to test run parts on the new machines. The main purpose of the bank is to allow additional material to be used for testing/ proving out. If for some reason in the final operations, material is found to be non-conforming, then assembly departments will not be expecting this material, resulting in no impact on line down dates.

Tooling Layout – Dependent on type of machine, tooling layout shows the necessary tools needed to produce features called out a process print. The perishable tooling is reviewed with the supplier to ensure holders, blocks, inserts, and brands are identical to what is currently being used in the factory to eliminate potential duplicates. If there is a duplicate of existing machinery, tool layout will be provided to supplier.

Fixture Concepts – Review fixture layout to ensure clearances are met on all machinable surfaces. Review the components used to ensure supplied components are the same as those currently being used in the factory. Elimination of redundant components minimizes the stocked inventory requirements and communizes the factory.

Layout – Review the machine layout configuration. Locations of emergency stops, retracts, operator control panel height, & lock out locations. Determine frequent fill locations of lubricants for ease of accessible, meets all of department regulations including; safety, ergonomics, and maintenance requirements.

Design Models – Once approved, design models show a 3-D concept of the machine. These are used to show a layout of the process and operator interaction with the equipment; showing a real-life representation of heights and distances. This also verifies the equipment will be able to safely make it from semi to its final installation location. Having a 3-D model assists with the logistics of moving it internally through the plant to a final location without hitting other assets or overhead truss work.

Maintenance Review – Present the new machine configuration to maintenance staff prior to signing off on machine layout. Look at build of material to communize with existing

assets to minimize the need for creating new part numbers. Look at the machine configuration to determine a location of each component to ensure ease of accessibility and determine a recommended spare parts list. Began setting up supplier based spare parts in internal stock room.

Safety Review – Meet with the supplier and safety department to review the machine layout. Ensure that the machine meets safety requirements as specified in the quoting manual. Interlocks, machine safe guarding, clearances, lock out procedures, distances, ergonomic requirements for loading and unloading meet regulations. Discuss any pinch points, operational procedure of the machine with safety, ergonomic rep, United Automobile Workers (UAW) safety and ergonomics.

Factory Implementation Requirements – Understanding of machines requirements: foundation footers, isolation concrete pad, electrical, air, height, exhaust, and support equipment needed.

Process Approvals – Approval signatures required by a multitude of departments including: manufacturing engineer, project manager, manufacturing engineer supervisor, business unit manager, general supervisor, maintenance, environmental, safety, ergonomics, facilities, industrial engineers, factory automation, robot automation, and production supervisor. This collection of signature acknowledges that the piece of equipment meets all parties' requirements therefore reducing issues when the machine arrives, along with prioritizing the resources for the implementation of the equipment.

Implementation Plan – Discuss how and when the new machine is expected to arrive. Prior to arrival, the logistics of shipment must be met. The site prep must be complete, discuss installation with internal resources including, machine movers, electricians, plumbers, HVAC, and the areas skilled trade.

Gaging Procurement – Based on the equipment purchased, gaging may vary. Some may require CMM for positional, while others requiring dial snap or dial bore gages, no/go plug gages. Determining what gages will be required for machine run off, to ensure they will not be needed during run off. If gages are unable to be released for machine runoff, new gages will need to be procured.

Transition Plan – Discuss prove out of new piece of equipment. Timing of when parts will be proven out, capability studies run, first piece inspections, and man power needed to operator new equipment.

Maintenance Plan – Determine the maintenance requirements on multiple levels (shift & trade). Individuals that will be selected to attend training and demonstrate machine function/ controls.

Spare Parts – Receive recommended spare parts list from supplier at document review. Many times, spare part lists are updated throughout the build and during final acceptance. Determine when the manual will be updated for the last time. When the supplier provides the list, maintenance engineers (mechanical & electrical) determine which components they want to stock in our own stockroom, based upon wearable component and lead times.

P.M.'s – A preventative maintenance plan is recommended by the supplier in the manual. However, maintenance engineers (mechanical and electrician) create P.M.'s for every asset prior to machine sign off. The P.M.'s is set up in different intervals (3 months, 6 months, and 1-year requirements.)

Machine Runoff – Run offs take place both internal and at the supplier's establishment. The purpose of a run off at the supplier facility is to ensure the equipment meets the expectation set out in the capital purchase agreement that the supplier signed prior to shipment. Any machine related issues will be addressed prior to arriving at the facility. Standard machines typically do not require machine run offs, however, depending on the nature of the business and additional requirements or processing, a run off may be justified.

Training – Training requirements for electricians and mechanics are to be included in purchasing of equipment. Dependent upon the supplier, the company may choose to use the training credits at a later time. If the machine manufacturer is new to our facility, training is required at the supplier's facility as part of the machine run off. Multiple groups of skilled trade employees are highly advised to travel to the manufacturers location to take part in the required training. Warranty on new assets consist of 1-year service, 2 years parts.

Shipment – Shipment date is determined prior to machine purchase and defined in the capital purchase agreement. Suppliers cover freight from sea port to their facility. Once unpackaged, set up, and run off successfully passes, the company will work with the supplier on shipping the machines from their facility to ours. During shipment

procedures, all fluids must be emptied from a machine, stored separately and clearly marked. All run off containers of material, tooling and fixturing are to be shipped with the machine during this period.

Installation – Installation responsibilities are determined during CPA signing. The following operations are discussed and agreed upon: rigging from transporter machine floor, moving of machine, setting machine on floor or riser, leveling of machine, electrical conduction from bus way to machine, provide air to machine, provide water to machine, steam to machine (if applicable), coolant or oil to machine (if applicable).

Routings – Internal part routing to be updated once machine is proven to be capable with multiple set ups and ISIR's passed. Cost collectors, CIPP collectors, and routings will be updated. NDS's will need updating, along with perishable and firm tooling to reflect process with the new machine. Kanban's for all tooling will need to be updated or transferred to new the machine. While updating part routing, review of quality inspection requirements to be updated to current gages will also need to be completed. Gages will need to be changed from previous machine/ assets to new machine.

Control Plan – Update quality control plan of parts. If processing of part is changed in any form, review must take place and updated. Review gages and processing of part to ensure gages and inspecting what is being produced and frequencies updated to match capability of new machine.

Red Tag – Red tag procedure is verification that the machine meets or exceeds safety requirements. Multiple signatures from support departments reflect acknowledgment that

requirement are meet. Signatures includes: safety, ergonomics, environmental, production supervisor, manufacturing engineer, facilities, & maintenance. A comprehensive list from each department is required to confirm their agreement that requirements are met as spelled out in the red tag procedure.

Runoff – During CPA, an exhibit is produced showing runoff criteria that the machine must meet a specified CPK value at their facility and again once the machine is installed at the company's facility. In the CPA, the part number or numbers along with a process chart or final print is provided. Prior to the run off, the manufacturing engineer will ship the parts (material) four to six weeks prior to the runoff. The supplier will prove out the machine, part program and inspection. They will then send the parts back to the company to be inspected by our quality organization to determine they have met all requirements on each individual part, prior to departing for machine run off. For the machine runoff, members of the organization include; project manager, operator of machine, manufacturing engineer, programmer of machine, electrician (skilled trade), mechanic (skilled trade), and a quality engineer. During the run off at the supplier's location, a red tag check is preformed prior to running any part to ensure all interlocks and safety equipment work as specified/ designed. Once the machine is deemed safe, the runoff may begin. Dependent upon supplier, the company will bring production gages to inspect parts for size. Some suppliers may operate and inspect parts, only allowing the company employees to record data, since ownership of machine not accepted until it arrives at our facility. While other suppliers are hands off and the company employees operate, load, unload, and inspect parts, informing supplier of results once complete. Thirty-two

consecutive parts are run, data is recorded per CPK requirements. Once the machine is accepted, paperwork is signed acknowledging acceptance that the criteria has been met at the supplier location. Shipping of the machine can then proceed. Following the decoupling of the machine to prep for transportation.

Material Flow, Prove Outs – Material banks are required for material to send material for supplier run off and internal run off. Banks arew put in process to eliminate production being accounted for assembly requirements. This material for machine runoff was started months prior to machine run off and delivered a few weeks after runoff. Additional inspections are then needed to ensure it meets specification and is then quarantine and reintroduced to production material to finish the remaining operations.

Final Sign Off/ Acceptance – Final sign off with supplier is the last step. Internal to the company, a comprehensive review of the list to determine that every line item ordered on the CPA had been filled. On the internal list, the following criteria reviewed shown in (Appendix B). Once all parties have signed for their section of responsibility, the business unit manager gives supply management authorization to make final payment to the supplier.

Roles and Responsibilities

By understanding the necessary step; now responsible parties that lead, approve, and support are shown in (Appendix C). Those parties are the following; Project Manager, Departmental Manufacturing Engineer, CNC Programmer, Automation Manufacturing Engineer, Manufacturing Engineering Supervisor, Departmental Supervisor, Material Scheduler, Business Unit Manager, EFES, Information Systems,

Controls Engineer, Safety, Environmental, Ergonomics, Maintenance, and Supply Management. All parties at hand have fragments of milestones which must be met to ensure schedules, budgets, and quality of products are met. By individually identifying each fragment once a project charter is developed, timelines and resources will be assigned. As shown in (Appendix D), examples of project tasks required from the Project Definition, Initial Data Acquisition, Data Acquisition, Procurement/ Acceptance, and Installation/ Production Start phases are shown. These tasks are laid out in (Appendix E) showing each of the 134 task, task descriptions, owner, responsible party, reasoning why task must be complete, and link to the company's corporate policy. Tasks are built from past experiences where lessons were learned, showing the start to end, in order to ensure the project is successful. By defining the task thoroughly, and understanding why corporate is mandating certain tasks, having a reference to the standard is essential to ensure the task meets the requirement.

In large corporations, personnel constantly change hands during large capital procurement projects to pursue new career opportunities. By documenting acceptance of the project with a project charter is accepted by leadership, this updated charter shows the current order procurement process, along with responsible parties.

CHAPTER 5: SUMMARY AND CONCLUSION

In large corporations, personnel are constantly moving and leaving jobs. By surveying multiple people in different parts of the organization to understand the current process, it became apparent roles and responsibilities were not known. Having a documented procedure for all capital equipment purchases, once the project charter has been accepted, responsible parties are mindful of their obligation to support it. Previously, due to turnover, multiple project managers conducted machine equipment purchases in a variety of ways.

Miscommunication with support departments was common, compounding issues related to failure of notification was prevalent. Many tasks were overlooked or not known, causing issues during start of production. These issues resulted in significant cost overages, missed delivery dates, and a decrease in overall employee morale.

Once the project charter is accepted, having a detailed process through production startup is essential. These clearly defined tasks in (Appendix D & E) show the new breakdown that all project managers agree upon while also meeting corporate mandates. By assigning responsible parties (organization members) to each phase, all groups of support departments within the company are aware of upcoming machine acquisitions and understand their role in bringing this piece of equipment into production.

One recommendation to this project is to build on new processing requirements into the defined task spreadsheet (Appendix D & E). As machines and processes of parts changes, the tasks/ requirement especially with I.T. related components constantly

change. Software and firmware are constantly being invented, creating understanding a supporting these new requirements are essential to future machine acquisitions.

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APPENDIX A

Questionnaire – Machine Procurement Process

1. Are you aware of the current procurement process?
2. Are you aware of what you; approve, lead, and support?
3. Were there any delays on the last machine purchase you were a part of?
    a. Could have those delays been resolved if discussed occurred prior in machine procurement?
4. Do you know when maintenance and ergonomics are to be involved with procurement?
5. Are you aware of any checklists to follow?
    a. How old is it?
6. What could streamline the machine acquisition process?
7. How long in the process were you notified of the machine purchase?
8. When are banks to be placed for machine run offs?
9. Were material handling devises considered during machine process?

APPENDIX B

John Deere Waterloo Works

Machine Final Acceptance Sign Off Sheet **Project / Cell Name:** _____

Machine (Asset) No.: _____ **Machine:** _____ (TYPE) _____ (BRAND) _____ (MODEL NO.)

Serial No.: _____ **P.O. NO.:** _____ **Supplier:** _____

Robot No.: _____ PRINT NAME SIGNATURE DATE

1. Documentation complete (Page 8.1 & 8.2)
   - Mechanical - Maintenance Engineer _____ _____ _____
   - Maintenance Procedures - Maintenance Engineer _____ _____ _____
   - Operator Manuals - Maintenance Engineer _____ _____ _____
   - Electrical – Electrical Maintenance Engineer _____ _____ _____

   Comments: _____
2. Complete BOM (As Built) Including OEM Part Numbers (Page 21.1)
   - Maintenance Engineer _____ _____ _____
3. Preventive Maintenance Recommendations (Page 2.7)
   - Maintenance Engineer _____ _____ _____
4. System Pressures & Hydraulic Lubrication (Page 5.1-6.2)
   - Maintenance Engineer _____ _____ _____
5. Training (Page 21.1)
   - Maintenance - Maintenance Engineer (Training) _____ _____ _____
   - Operator – Production Supervisor _____ _____ _____
   - NC Programmers (if applicable) – NC Programmer _____ _____ _____
6. System Back-up CD and Procedures (Page 4.8-4.9)
   - Program Files - Electrical Maintenance Engineer _____ _____ _____
   - Parameters - Electrical Maintenance Engineer _____ _____ _____
   - Source code - Electrical Maintenance Engineer _____ _____ _____
   - Alarm Recovery - Electrical Maintenance Engineer _____ _____ _____

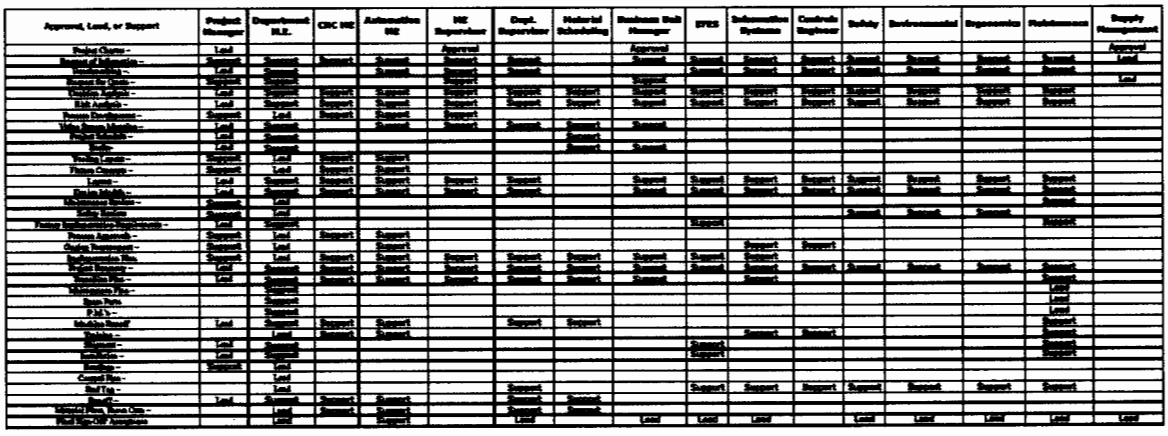
   Comments: _____
7. Workholding and Durable Tooling (Section 10)
   - Received - Manufacturing Engineer _____ _____ _____
   - Documentation – Maintenance Eng. _____ _____ _____
   - Maintenance Tooling - Maintenance Engineer _____ _____ _____
8. Perishable Tooling (Section 10)
   - Tooling Engineer _____ _____ _____

John Deere Waterloo Works

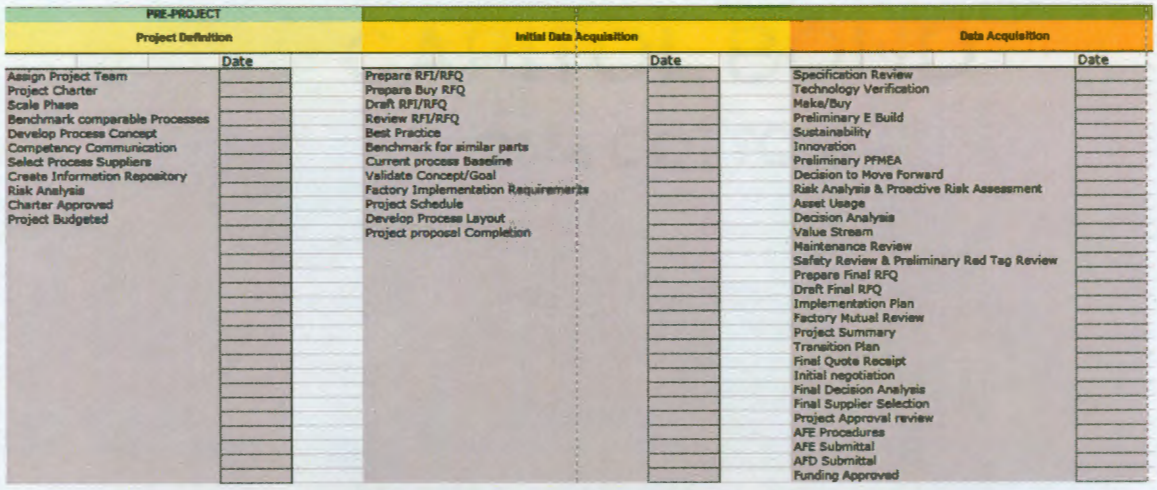
Machine Final Acceptance Sign Off Sheet

Machine (Asset) No.: _____	PRINT NAME	SIGNATURE	DATE
9. Measuring Systems, Tool Management Systems, Machine Monitoring Systems			
• Received - Manufacturing Engineer	_____	_____	_____
• Operational – NC Programmer,	_____	_____	_____
• Documentation – Maintenance Eng.	_____	_____	_____
	_____	_____	_____
10. Installation Complete			
• Facilities Engineer	_____	_____	_____
• Manufacturing Engineer	_____	_____	_____
11. Runoff / Acceptance Complete, Machine Accuracy (Page 9.1-9.18)			
• Manufacturing Engineer Supervisor	_____	_____	_____
12. Automation / Machine Risk Assessment Complete (ANSI/RIA R15.06-1999 /)			
• Safety Engineer RA REQUIRED? ☐ YES ☐ NO	_____	_____	_____
Comments: _____			
13. Warranty Start Date – Placard in place showing warranty dates (Page 20.1)			
• Onsite Labor Warranty until:		_____	
• Parts Warranty until:		_____	
• Additional Warranty until: _____		_____	
• Supplier	_____	_____	_____
• Maintenance Engineer	_____	_____	_____
FINAL SIGN OFF:			
• MAINTENANCE AREA SUPERVISOR	_____	_____	_____
• MAINTENANCE ENGINEER SUPERVISOR	_____	_____	_____
• PRODUCTION SUPERVISOR	_____	_____	_____
• MANUFACTURING ENGINEER	_____	_____	_____
• MANUFACTURING ENGINEERING SUPERVISOR	_____	_____	_____
• BUSINESS UNIT MANAGER "I authorize final Payment"	_____	_____	_____

APPENDIX C



APPENDIX D



PRE-PROJECT					
Project Definition		Initial Data Acquisition		Data Acquisition	
	Date		Date		Date
Assign Project Team		Prepare RFI/RFQ		Specification Review	
Project Charter		Prepare Buy RFQ		Technology Verification	
Scale Phase		Draft RFI/RFQ		Make/Buy	
Benchmark comparable Processes		Review RFI/RFQ		Preliminary E Build	
Develop Process Concept		Best Practice		Sustainability	
Competency Communication		Benchmark for similar parts		Innovation	
Select Process Suppliers		Current process Baseline		Preliminary PFMEA	
Create Information Repository		Validate Concept/Goal		Decision to Move Forward	
Risk Analysis		Factory Implementation Requirements		Risk Analysis & Proactive Risk Assessment	
Charter Approved		Project Schedule		Asset Usage	
Project Budgeted		Develop Process Layout		Decision Analysis	
		Project proposal Completion		Value Stream	
				Maintenance Review	
				Safety Review & Preliminary Red Tag Review	
				Prepare Final RFQ	
				Draft Final RFQ	
				Implementation Plan	
				Factory Mutual Review	
				Project Summary	
				Transition Plan	
				Final Quote Receipt	
				Initial negotiation	
				Final Decision Analysis	
				Final Supplier Selection	
				Project Approval review	
				AFE Procedures	
				AFE Submittal	
				AFD Submittal	
				Funding Approved	

PROJECT						POST-PROJECT	
Data Acquisition		Procurement/Process Acceptance		Installation & Production Start		Optimize & Finalize Project	
	Date		Date		Date		Date
Specification Review		Final Negotiations		Shipment to Factory		Documentation Review	
Technology Verification		Quote Review		Final Site Preparation		OPE Level	
Make/Buy		Tool Layouts		OPF Changeover		Final Invoice Payment	
Preliminary E Build		Fixture Concept		Equipment Installation		Accounting Closure	
Sustainability		TCS Review		Execute Payment Terms		Check List Closure	
Innovation		Develop Final Purchase Order		Red Tag Process		Process Optimization	
Preliminary PFMEA		Final PO Check Off		Operator Training		Final Standards	
Decision to Move Forward		Write PO		Factory Capability Study		Lessons Learned Review	
Risk Analysis & Proactive Risk Assessment		Approve PO		Quality Data Review		Team Sign Off	
Asset Usage		Issue PO		Lesson Learned review		Project Audit	
Decision Analysis		PO Down Payment		Update Routing		Project Completion Review	
Value Stream		Department Kick Off		Acceptance Study Completion		Project Finish	
Maintenance Review		Final E Build		Preliminary Process Audit		Project Close	
Safety Review & Preliminary Red Tag Review		Final Floor Plan		Preliminary Standard			
Prepare Final RFQ		Asset Number		Production Handover			
Draft Final RFQ		Post Processor					
Implementation Plan		Vericut Model					
Factory Mutual Review		Process Design Approval					
Project Summary		Design Approval Payment					
Transition Plan		Foundation Approval					
Final Quote Receipt		Site Preparation					
Initial negotiation		Complete PFMEA					
Final Decision Analysis		Fixture, Gage Strategy					
Final Supplier Selection		Fixture, Gage Order Placement					
Project Approval review		Perishable Tool Order					
AFE Procedures		TDN Data Build					
AFE Submittal		Routing					
AFD Submittal		Control Plan					
Funding Approved		Maintenance Plan					
		Schematic Approval					

APPENDIX E

Description			Responsible Person	Primary Link	Secondary Link	Supporting Links Supporting Data
1	Assign Project Team	Assign a Project Lead Process Replacement, EPDP, Capacity Identify Core Project Team Manufacturing Engineering Quality Engineering Maintenance	Factory Management		Capital Acquisition ARIS Process Map - Level 3	CEAP - Understanding ARIS EPC Example
				CEAP - Project Manager Responsibilities	CEAP - Project Planning Tool	CEAP - W315 1 Process Tool Procurement Process Map
2	Project Charter	Define project requirements/Charter (Template provided) Business Justification	Project Lead	Business Conduct Guidelines	Global Policies	Electronic Resources Policy
				CEAP-Define Project Requirements-Charter	Cotton Investment Strategy Charter	CEAP - W315 1 Issue 02 Mc acquisition procedure
3	Scale Phase	Scale Project Tracker to Project	Project Lead	JDQPS 5.20 Equipment Acquisition and Implementation	Capital Acquisition ARIS Map - Project Definition Phase 0	Grey out (Mark 0) on Deliverables sheet items not required for a specific project. Add items that are required for this specific Project.
4	Benchmark comparable Processes	Benchmark comparable processes from other factories for Standardization opportunities	Project Lead	JDQPS 5.19 Technology Leadership and Deployment		Part of DCV Process "We can all buy the same Process - it is the application of the Process in the process that differentiates"
5	Develop Process Concept	Develop Concept for the new Process	Project Lead	CEAP - 12 Steps to Successful Automation		
				CEAP - Request for Quote - Outline		
6	Competency Communication	Communicate Project Concepts to: ME Platform Lead Enterprise Competency Division Competency Lead IM&S Global Category Manager	Project Lead	DCV Home Page - Manufacturing Design Section	Team Enrichment Site	Charter in Step 2 is basic document