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Supervisor:	Kjell Enger, BUC
Contracting Entity:	Kongsberg Protech Systems
Group:	
Halvor Eide, Ørjan Ohm, Sander K. Trandem, Knut Anders Lia and Alexander Svendsen	

Document History		
Rev.	**Changes**	**Date**
-		2012-01-04
1	- Changed priority on req. K03.5 and K03.7. - Added req.: K03.13, K03.14, K03.15, K03.16, K03.17, K03.18, K03.19, K03.20, K04.7-K04.13, K03.22 - Replaced req.: K03.4 with K03.18, K04.2 with K04.13, K04.3 with K03.21 -Added priorities for assembly/test in production jig requirements.	2012-05-23

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1 Introduction

Production Technology is a Bachelor Thesis taken on by five mechanical engineering students from Buskerud University College in Kongsberg.

The Scope is limited to five study credits for the first semester (fall 2011), then 15 study credits for the second semester (spring 2012). This is estimated to 550 work hours per group member. There will be a higher priority on documentation then in a normal industry. This will give a better basis for evaluating the project.

The purpose of this project is to evaluate production models for Kongsberg Protech Systems (KPS). Kongsberg Protech Systems has developed a new product called Protector Medium Caliber that is going into production. To make the production effective they need to develop a specific production model that they can integrate in all their locations, and in different production scale.

The company has other similar products that are already in production. In the existing production there are used several Lean tools to make the production as efficient as possible. The difference between these products and the new one is the size and weight. The existing products are of smaller caliber and therefore smaller in size and easier to handle, than the new Protector Medium Caliber. Due to the size and weight of the product they need to develop a completely new assembly process. The production process is the backbone in the company and it is vital for the company to compete with others.

Our assignment is to make a main study that evaluates different production models and create concepts for the production of Protector Medium Caliber. The production is divided into two cases with different production rate, where Case 1 handles high rate production and Case 2 handles low rate production. For both cases, we will consider the need of cranes, lifts and other equipment to make the assembly as easy and effective as possible. In the production of Protector Medium Caliber there will be a need for a jig or a fixture to hold the product while assembling and testing. This jig will be designed in SolidWorks and integrated in our production model.

To be able to make a good analysis, we need to learn about production technologies and Lean manufacturing. By learning the basics of these subjects, we will ensure effective manufacturing of quality products and a safe and good environment for the workers. To accomplish this, two generic pre-studies will be produced as supporting literature. One study for production technologies and one study for Lean manufacturing. The two studies will be used as a support for arguments for the different choices and conclusions we make in our main study.

This Bachelor Thesis is a theoretical study and takes form of a written report with drawings and illustrations. The sources used are internet, personnel of KPS and literature in form of books. Project expenses are literature and printing of reports and poster.

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1.1 Document Overview

This document is one of many reports in the Bachelor Thesis 2012-2.

The Figure below will give an overview and placement of the reports and documents for the Bachelor Thesis 2012-2. The textboxes represents documents and the green box is representing this document. The Appendix documents are not listed.

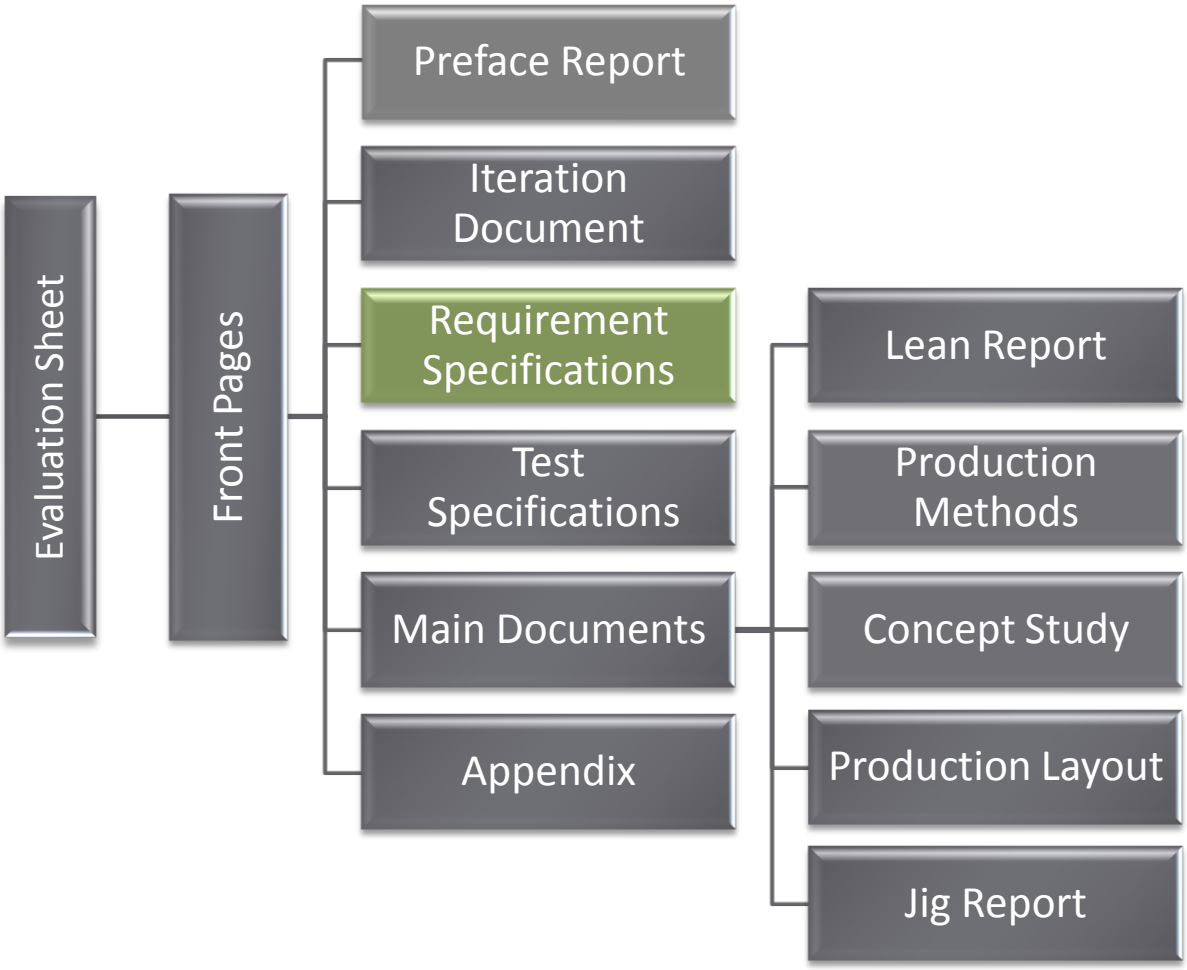

Figure 1 - Document Relation

1.2 Document Purpose

This document's purpose is to define the requirement specifications for this project.

2 Framework Requirements

The task we are given from KPS is divided in two parts. The first part is a pre-study, where we are going to make a study of production technologies and Lean manufacturing. The second part is the main study, where we shall evaluate different production concepts and create a production concept with two cases for the new product called Protector Medium Caliber RWS. Taking size, cost and production rate into consideration. One of the cases will handle low rate production and one will handle high rate production. When this is established, we are going to design a production jig that will be integrated in our production models.

2.1 Priority List

Some of the requirements have different priority. We define the priorities as follow:

A – High priority

B – Medium priority

C – Low priority

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3 Requirement Specifications

Table 1 - Documentation Requirements

K01 Documentation			
ID	**Requirement**	**Comments**	**Priority**
K01.1	Document language: English	All documents has to be in English	A
K01.2	Report	10 copies of the complete report	A
K01.3	CD/DVD	6 copies of CD/DVD	C

Table 2 - Pre-Study Requirements

K02 Pre Study			
ID	**Requirement**	**Comments**	**Priority**
K02.1	Find relevant information about Lean tools.	KanBan, 5S, 6S, Pull system, Kaizen, Value stream mapping, One piece flow.	A
K02.2	Find relevant information about production methods.	Make a study of different solutions to start up a new production.	A

Table 3 - Production Layout Requirements

K03 Production Layout			
ID	**Requirement**	**Comments**	**Priority**
K03.1	Production concept shall result in producing one product per week.		A
K03.2	Production concept shall result in producing one product per day.		A
K03.3	Production has to be ESD safe.		A
~~K03.4~~	The product must be able to be tested at all steps in the production.	This req. is replaced by req. K03.18	A
K03.5	Production area should not exceed 900 m^2	900 m^2 is available today.	B
K03.6	Lifting device should withstand at least 5000 kg.		A
K03.7	Distance to ceiling shall be at least 6 meter	Lifting device for lifting 5000 kg, 6m high.	B

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K03 Production Layout			
ID	**Requirement**	**Comments**	**Priority**
K03.8	Develop cost models for the production models, in relation to production rate, one per day/one per week.		A
K03.9	All models shall be generic.	Be able to be used with changes.	A
K03.10	Hand tools shall always be available.	Always on hand.	A
K03.11	Test equipment shall always be available.	Always on hand.	A
K03.12	Parts to be assembled shall always be available.	Always on hand. Logistic and grouping of parts.	A
K03.13	At least 1.5 persons on every assembly station.		B
K03.14	No more than 2 persons on every assembly station.		B
K03.15	No more than 1 person on every test station.		A
K03.16	FAT test shall be executed separately from production.		A
K03.17	There shall be at least one backup station.	For troubleshooting.	A
K03.18	All parts shall be tested in IHT.		B
K03.19	6 effective work hours per day		B
K03.20	7.5 salaried hours per day		C
K03.21	The product must be reachable for a lifting device from above.		A
K03.22	The backup station must have extra space for test equipment.	For troubleshooting.	B

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Table 4 - Production Jig Requirements

K04 Production Jig				
ID	**Requirement**	**Comments**	**Priority**	
			Test	**Assem.**
K04.1	The jig has to be ESD safe.		A	B
~~K04.2~~	The jig shall withstand at least 3000 kg.	Replaced with K04.14	A	A
~~K04.3~~	The product must be reachable for a lifting device from above during all operations of the jig.	Replaced with K03.21	A	A
K04.4	The product must be reachable on the jig, for assembling of parts.		A	A
K04.5	The product must be reachable from underneath the jig.		B	A
K04.6	The product has to be able to be tested on the jig.		A	NA
K04.7	The jig must withstand a full stop from full rotation at 90 degrees/sec, in 0.5 sec when rotating testing.		A	NA
K04.8	The jig needs a crawl opening underneath the product at minimum 140 cm.		B	A
K04.9	No part of the jig shall obstruct the nut gaps of the main frame.		A	A
K04.10	No parts of the jig shall obstruct the rotation and/or elevation of the product.		A	A
K04.11	The jig shall be made with a minimum risk of clamp danger.		A	A
K04.12	The jig shall be made in a height for ergonomically use.		B	B
K04.13	The jig shall not be able to tip.		A	A
K04.14	The jig shall withstand a weight of 6560 kg.		A	A

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4 Abbreviations

Table 5 - Abbreviations

Abbreviation	Description
Assem.	Assembly
BUC	Buskerud University College
ESD	Electro Static Discharge
ID	Identification
IHT	In house test
KPS	Kongsberg Protech Systems
NA	Not Applicable
req.	Requirement
RWS	Remote Weapon Station
Rev.	Revision
Sec	Second

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