



جامعة الجميع الذكية
EVERYONE'S SMART UNIVERSITY

Everyone's Smart University

Project (Spring 2021)

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Section

Master

Date

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Course Code

(PMG510)

Project Risk Management

Instructions:

- آخر موعد للتسليم هو يوم السبت 2021-05-08 في تمام الساعة ٩ مساءً.
- الإجابة متاحة باللغة الإنجليزية أو اللغة العربية مع مراعاة أن تكون المصطلحات العلمية باللغة الانجليزية.
- يتم تسليم المشروع في صيغة ملف . pdf مع الالتزام نموذج الجامعة ولن تقبل أي مستندات أخرى.
- يجب مراعاة أقسام البحث الرئيسية (مقدمة Introduction، دراسات علمية سابقة Literature Review، طريقة البحث Methodology، النتائج والمناقشة Results and Discussion، وأخيراً المراجع References . وان كان هناك ملحقات Appendices يتم إضافتها)
- يجب الالتزام بـ Theme موحد كما يلي:
- حجم الخط 12.
- نوع الخط Arial.
- لون الخط أسود.
- المسافة بين الأسطر 1.5 line spacing
- عدد صفحات البحث (لا يقل عن ثلاث صفحات ولا يزيد عن ست صفحات).

Instructor's Name: Eng. Mosaab M. Hamed

Project:

Risk Identification and Analysis (Based on the project you chose in APM)

The objective of this report is to identify project risks, prepare a risk probability matrix, and carry out an analysis of selected risks. Referring to the project you select in **Advanced projects management APM course**, your task is to prepare a risk management plan that identifies potential risks in **the selected stage of the project** and identify risk management strategies.

From the course content and readings, you know that the overall purpose of risk planning is to anticipate possible risk events and be ready to take appropriate action when risk events occur—to eliminate or reduce negative impacts on the project.

You may wish to begin this exercise with a brainstorming about potential risks to get candidate risks “on the table” for consideration. And then identify and refine that wording for risks that have some realistic chance of occurring in this stage. For example, potential weather problems present a real obstacle to completing field data collection by the planned completion date. It is also an issue that the project manager will ultimately have to plan for, as opposed to other issues such as a major disaster (e.g., your office burning down), is not a high-enough probability event that requires much time in planning. As described below, you will select several of the identified risks and carry out a risk analysis.

You will use the distilled list of risks to make a risk probability/impact matrix. The matrix will have at least three categories (high/medium/low) for probability and impact.

Remember that it is important to name risks effectively—use words that describe the risk event and point to the impact on the project (e.g., “injury of field technician disrupts data installation work”).

After completion of the risk matrix, document a risk analysis for the selected risks. This detailed documentation for that selected risk will include:

- a description of the risk and potential impacts (schedule, quality of work, cost, etc.) on the project.
- indicators or triggers that would be monitored to help identify the risk as early as possible.
- specific risk response strategies to take.

Using probability and impact matrix calculate the **Expected Monetary Value (EMV)** for all risks that have the impact in terms of cost \$\$.

Best of luck...

المشروع:

التعرف على المخاطر وتحليلها (بحث مبني على مشروعك الذي اخترته في مادة ادارة المشاريع المتقدمة)

الغرض من هذا التقرير هو التعرف على المخاطر المحيطة بالمرحلة التي تختارها المرحلة من مراحل مشروعك (نفس المرحلة التي اخترت التطرق لها في مشروعك لمادة إدارة المشاريع المتقدمة Advanced project management) حيث أن مهمتك هي تحضير خطة متكاملة لإدارة المخاطر تشمل التعريف بالمخاطر المحتملة التي تحيط بتلك المرحلة وتحضير مصفوفة احتمالية المخاطر ومن ثم القيام بالتحليل لهذه المخاطر المختارة وتحديد استراتيجيات ادارة المخاطر المناسبة لكل خطر على حدة.

من محتويات المقرر والمصادر الأخرى المتاحة أصبحت تعلم الان أن الغرض العام لمرحلة التخطيط للمخاطر هي توقع أحداث المخاطر المحتملة والتجهز لاتخاذ ردة الفعل المناسبة عند وقوع الخطر – لمنع أو تقليل الاثار السلبية على المشروع.

قد تحبذ بداية هذا البحث بعصف ذهني عن ماهية المخاطر التي قد تحيط بتلك المرحلة من مراحل مشروعك, وذلك للحصول على قائمة بتلك المخاطر. ومن ثم تحديد وتصفية هذه القائمة للوصول إلى قائمة مختصرة بالمخاطر التي لها فرصة واقعية أكبر في الحدوث. على سبيل المثال: المشاكل الجوية المتوقعة والتي تمثل عقبة حقيقية أمام اكتمال جمع البيانات من المواقع في أو قبل الوقت المحدد، هذه تعتبر مشكلة على مدير المشاريع أن يضعها في الحسبان. من ناحية أخرى، فإن المخاطر غير الواقعية مثل الكوارث الطبيعية والأعاصير (تلك التي تسبب حريقاً بمكتبك وفقدان الأوراق المهمة) ليست لها احتمالية وقوع عالية وبالتالي لاتستدعي تضيق الكثير من الوقت في التخطيط لها. كما سيتبين لك، ستقوم باختيار عدة مخاطر من تلك التي قمت بالتعرف عليها لتحليلها.

ستقوم باستخدام هذه القائمة المختصرة لعمل مصفوفة المخاطر (الاحتمالية/الأثر). المصفوفة ستحتوي على الأقل على ثلاث تصنيفات (عالي/متوسط/منخفض) للإحتمالية والأثر.

لاتنس استخدام أسماء تصف طبيعة المخاطر بصورة فعالة – قم باستخدام كلمات تصف الحادثة الخطرة وتشير الى أثرها على المشروع (مثل: إصابة أحد الفنيين في الموقع مما يؤثر على أعمال التركيب).

بعد انتهاءك من مصفوفة المخاطر، قم بتوثيق تحليلك للمخاطر المختارة. هذا التسجيل المفصل للمخاطر يجب أن يتضمن:

- وصف للخطر واثاره المحتملة (الجدولة، جودة العمل، التكلفة، الخ)
- المؤشرات والمحفزات التي يجب مراقبتها للمساعدة في التعرف على هذا الخطر قبل وقوعه
- تفصيل للاستجابة المقترحة للتصدي لهذا الخطر

باستخدام مصفوفة الاحتمالات والتأثير ، احسب القيمة النقدية المتوقعة (EMV) لجميع المخاطر التي لها تأثير من حيث التكلفة \$\$.

مع تمنياتي بالتوفيق..

New High-Speed Slitter (HSS) Line in Finishing Dept

1.0 INTRODUCTION

A risk is an event or condition that, if it occurs, could have a positive or negative effect on a project's objectives. Risk Management is the process of identifying, assessing, responding to, monitoring and controlling, and reporting risks. This Risk Management Plan defines how risks associated with the New High-Speed Slitter (HSS) Line project will be identified, analyzed, and managed. It outlines how risk management activities will be performed, recorded, and monitored throughout the lifecycle of the project and provides templates and practices for recording and prioritizing risks by the Risk Manager and/or Risk Management Team.

Risks related to Project must be identified and documented based on the methodology and Risk Management Guide.

2.0 Risk management Procedure

2.1 Process

The project manager working with the project team and project sponsors will ensure that risks are actively identified, analyzed, and managed throughout the life of the project. Risks will be identified as early as possible in the project so as to minimize their impact. The steps for accomplishing this are outlined in the following sections. The project manager will serve as the Risk Manager for this project.

Risks related to Project must be identified and documented based on the methodology in NIST SP 800-30, Risk Management Guide for Information Technology Systems.

2.2 ROLES AND RESPONSIBILITIES

Role	Responsibilities
Project Manager (PM)	PM is a member of the Integrated Project Team (IPT). The PM determines if the Risk is unique, identifies risk interdependencies across projects, verifies if risk is internal or external to project, assigns risk classification and tracking number. During the life of the project, they continually monitor the projects for potential risks.
Integrated Project Team	The IPT is responsible for identifying the risks, the dependencies of the risk within the project, the context and consequence of the risk. They are also responsible for determining the impact, timing, and priority of the risk as well as formulating the risk statements.
Risk Owner(s)	The risk owner determines which risks require mitigation and contingency plans, he/she generates the risk mitigation and contingency strategies and performs a cost benefit analysis of the proposed strategies. The risk owner is responsible for monitoring and controlling and updating the status of the risk throughout the project lifecycle. The risk owner can be a member of the project team.
Other Key Stakeholders	The other stakeholders assist in identifying and determining the context, consequence, impact, timing, and priority of the risk.

2.3 Risk Identification

Risk identification will involve the project team, appropriate stakeholders, and will include an evaluation of environmental factors, organizational culture and the project management plan including the project scope, schedule, cost, or quality. Careful

attention will be given to the project deliverables, assumptions, constraints, WBS, cost/effort estimates, resource plan, and other key project documents.

2.3.1 Methods for Risk Identification

The following methods will be used to assist in the identification of risks associated with New High-Speed Slitter (HSS) Line Project:

- Brainstorming
- Interviewing
- SWOT (Strengths, Weaknesses, Opportunities and Threats)
- Diagramming

A Risk Management Log will be generated and updated as needed and will be stored electronically in the project library.

2.4 Risk Analysis

All risks identified will be assessed to identify the range of possible project outcomes. Risks will be prioritized by their level of importance. Now we have a list of risks, we will make a risks matrix (determine the probability and impact of each risk), which will go after that to risk register. For Risk matrix, [please see the Appendix A](#)

2.4.1 Qualitative Risk Analysis

The probability and impact of occurrence for each identified risk will be assessed by the project manager, with input from the project team using the following approach:

Risk Matrix -Qualitative		Probability				
Consequence		Rare E	Unlikely D	Possible C	Likely B	Almost Certain A
5	Catastrophic	Medium	High	High	Extreme	Extreme
4	Major	Medium	Medium	High	High	Extreme
3	Moderate	Low	Medium	Medium	High	High
2	Minor	Low	Low	Medium	Medium	High
1	Insignificant	Low	Low	Low	Medium	Medium

Risks that fall within the RED, ORANGE and YELLOW zones will have risk response plan which may include both a risk response strategy and a risk contingency plan.

2.4.2 Quantitative Risk Analysis

Analysis of risk events that have been prioritized using the qualitative risk analysis process and their affect on project activities will be estimated, a numerical rating is applied to each risk based on quantitative analysis, and then documented in this section of the risk management plan.

<u>Risk Matrix - Quantitative</u>		Probability				
Consequence		Rare E	Unlikely D	Possible C	Likely B	Almost Certain A
5	Catastrophic	0.05	0.1	0.15	0.2	0.25
4	Major	0.04	0.08	0.12	0.16	0.2
3	Moderate	0.03	0.06	0.09	0.12	0.15
2	Minor	0.02	0.04	0.06	0.08	0.1
1	Insignificant	0.01	0.02	0.03	0.04	0.05

2.5 Risk Response Planning

Each major risk (those falling in the Red, Orange & Yellow zones) will be assigned to a risk owner for monitoring and controlling purposes to ensure that the risk will not “fall through the cracks”.

For each major risk, one of the following approaches will be selected to address it:

- **Avoid** – Eliminate the threat or condition or to protect the project objectives from its impact by eliminating the cause
- **Mitigate** – Identify ways to reduce the probability or the impact of the risk
- **Accept** – Nothing will be done
- **Contingency** – Define actions to be taken in response to risks

- **Transfer** – Shift the consequence of a risk to a third party together with ownership of the response by making another party responsible for the risk (buy insurance, outsourcing, etc.)

For each risk that will be mitigated, the project team will identify ways to prevent the risk from occurring or reduce its impact or probability of occurring. This may include prototyping, adding tasks to the project schedule, adding resources, etc. Any secondary risks that result from risk mitigation response will be documented and follow the risk management protocol as the primary risks.

For each major risk that is to be mitigated or that is accepted, a course of action will be outlined in the event that the risk does materialize in order to minimize its impact.

Please see the table 1 in the Appendix B

2.6 Risk Monitoring, Controlling, And Reporting

The level of risk on a project will be tracked, monitored and controlled and reported throughout the project lifecycle.

Risks will be assigned a risk owner(s) who will track, monitor and control and report on the status and effectiveness of each risk response action to the Project Manager and Risk Management Team on 18 months

A “Top 10 Risk List” will be maintained by the PM or IPT and will be reported as a component of the project status reporting process for this project.

All project change requests will be analyzed for their possible impact to the project risks.

As Risk Events occur, the list will be re-prioritized during weekly reviews and risk management plan will reflect any and all changes to the risk lists including secondary and residual risks.

Management will be notified of important changes to risk status as a component to the Executive Project Status Report every two weeks.

The Project Manager (PM) will:

- Review, reevaluate, and modify the probability and impact for each risk item every two weeks
- Analyze any new risks that are identified and add these items to the risk list (or risk database).
- Monitor and control risks that have been identified
- Review and update the top ten risk list.
- Escalate issues/ problems to management.

The Risk Owner will:

- Help develop the risk response and risk trigger and carry out the execution of the risk response, if a risk event occurs.
- Participate in the review, re-evaluation, and modification of the probability and impact for each risk item on a weekly basis.
- Identify and participate in the analysis of any new risks that occur.
- Escalate issues/problems to PM that,
 - Significantly impact the projects triple constraint or trigger another risk event to occur.
 - Require action prior to the next weekly review
 - Risk strategy is not effective or productive causing the need to execute the contingency plan.

2.7 Risk Contingency Budgeting or EVM

A risk contingency budget can be established to prepare in advance for the possibility that some risks will not be managed successfully. The risk contingency budget will contain funds that can be tapped so that your project doesn't go over budget.

There is a total of SAR 212,392 in the New High-Speed Slitter (HSS) Line Project budget allocated for Risk Management activities. These activities may include, but are not limited to, identifying, analyzing, tracking, controlling, managing, and planning for risks. This also includes creating and updating the risk response strategies and contingency plans.

we calculate the EMV cost for our project. All the numbers you are going to see are not exact cost but it was evaluated based on experience. The total potential impact on the plan is SAR 4,117,800 while the contingency cost is SAR 212,392.

Please see Appendix C

3.0 Tools and Practices

A Risk Management Log will be maintained by the project manager and will be reviewed as a standing agenda item for project team meetings.

4.0 Closing a Risk

A risk will be considered closed when it meets the following criteria:

- Risk is no longer valid
- Risk Event has occurred
- Risk is no longer considered a risk
- Risk closure at the direction of the Project Manager

5.0 Discussion

In (Table 1, Appendix B) we can see the result of reposing plan and how to mitigate the risk. It is important to note that we should be aware of all risks but shouldn't waste the time on risks with green color, it is better to focus on orange and red risks because they have higher probability and huge impact.

In (Table 2, Appendix C) All the numbers you are going to see are not exact cost but it was evaluated based on experience. The total potential impact on the plan is **SAR 4,117,800** while the contingency cost is **SAR 212,392**.

6.0 REFERENCE

Fundamentals of Risk Management: Understanding, Evaluating and Implementing Effective Risk Management by Paul Hopkin

APPENDIX A: Risk matrix

Probability The likelihood of the event leading to the assessed Consequence					Risk Matrix				
Risk Matrix- F	Descriptor	Judgment	Frequency	Experience					
A	Almost certain	Almost certain to occur	Very High, may occur at least several times per year.	A similar outcome has arisen several times per year in the same location, operation or activity.	0.05 (Medium)	0.1 (High)	0.15 (High)	0.2 (Extreme)	0.25 (Extreme)
B	Likely	More likely than not to occur	High, may arise about once per year.	A similar outcome has arisen several times per year in Aluminium.	0.04 (Medium)	0.08 (Medium)	0.12 (High)	0.16 (High)	0.2 (Extreme)
C	Possible	As likely to occur as not to occur	Possible, may arise at least once in a one to ten year period.	A similar outcome has arisen at some time previously in Aluminium	0.03 (Low)	0.06 (Medium)	0.09 (Medium)	0.12 (High)	0.15 (High)
D	Unlikely	Less likely not to occur than to occur	Not Impossible, likely to occur during the next ten to twenty five years.	A similar outcome has arisen at some time previously in Aluminium worldwide.	0.02 (Low)	0.04 (Low)	0.06 (Medium)	0.08 (Medium)	0.1 (High)
E	Rare	Not very likely to occur	Very Low, very unlikely to arise during the next 25 years.	A similar outcome has arisen in the world-wide industry, but not in Aluminium worldwide.	0.01 (Low)	0.02 (Low)	0.03 (Low)	0.04 (Medium)	0.05 (Medium)

CONSEQUENCE The outcome or significance of the assessed risk occurring					
	Rating				
	1	2	3	4	5
	Insignificant	Minor	Moderate	Major	Catastrophic
Health and Safety	Near miss.	Medical treatment, First aid required no Lost time or occupational illness.	Lost time or restricted injury or occupational illness (recoverable).	Single fatality; serious injury or occupational illness (non-recoverable) or permanent major disabilities (acute or chronic).	Multiple fatalities of staff, contractors or the public.
Environment	Negligible environmental impact, managed within operating budgets.	Environmental damage requiring up to 1 million SR to study or correct.	Short-term (<1 yr) environmental damage, or requiring up to 5 million SR to correct.	Medium-term (1-5 yr) environmental damage, or requiring 5 to 20 million SR to study or correct.	Long term environmental damage (5 years or longer), or requiring >20 million SR to study or correct.
Regulatory	No breach of licenses, standards, guidelines or related audit findings.	Breach of internal procedures or guidelines.	Breach of standards, guidelines or impending legislation, or subject raised as a corporate concern through audit findings or voluntary agreements.	Breach of licenses, legislation, regulation or Corporate-mandated standards.	Regulatory intervention and prosecution possible.
Image & Reputation	Reference to community consultation group Public awareness may exist, but there is no public concern.	Adverse news in local media Concerns on performance raised by shareholders, political or the community.	Adverse news in state or regional media Decrease in shareholder, political or community support.	Damage to corporate reputation at national level; raised in national media Significant decrease in shareholder, political or community support.	Damage to corporate reputation at international level; raised in international media. Major loss of shareholder, political or community support.
Financial	Direct loss or increased cost below 0.2 million SR. Negligible estimating error or capital loss Negligible fraud.	Direct loss or increased cost of 0.2 - 1 million SR. Estimating error or capital loss of 0.2 - 1 million SR. Fraud 0.2 - 1 million SR.	Direct loss or increased cost of 1 - 5 million SR. Estimating error or capital loss of 1 - 5 million SR. Fraud 1 - 2.5 million SR.	Direct loss or increased cost of 5 - 20 million SR. Estimating error or capital loss of 5 - 20 million SR. Fraud 2 - 10 million SR.	Direct loss or increased cost > 20 million SR. Estimating error or capital loss > 20 million SR. Fraud > 10 million SR.

Node		Source of Risk	Category	Causes	Probabil ity		Impact / Consequen ces		Safeguar ds	Sever ity	Response plan	Responsi bility
1	Preparat ion Station - HSS	ASRS Coil Car Failure	Financial	Mechanic al Failure	B	0.04	1	Coil loading stop	PM Check	Mediu m	Implement the New Design Change by Vendor	Maintena nce Departme nt
			Financial	Electrical Failure	E	0.01	1	Coil loading stop	PM Check	Low		Maintena nce Departme nt
		CPS Entry coil Car Failure	Financial	Mechanic al Failure	E	0.01	1	Coil loading stop	PM Check	Low		Maintena nce Departme nt
			Financial	Electrical Failure	E	0.01	1	Coil loading stop	PM Check	Low		Maintena nce Departme nt
		DeCoiler Failure	Financial	Mechanic al Failure	D	0.02	1	Coil loading stop	PM Check	Low		Maintena nce Departme nt
			Financial	Electrical Failure	E	0.01	1	Coil loading stop	PM Check	Low		Maintena nce Departme nt

		Improper Coil Handling	Health and Safety	Human Error	D	0.02	1	Injury	PPE, SWI & Training	Low		Maintenance Department
		Heat Stress	Health and Safety	High Temperature and humidity	C	0.03	1	Heat Related Injury	Heat Stress prevention Plan	Medium	Provide the Pull pit for the field Operator	Engineering Department
		Improper Scrap Coil Handling	Health and Safety	Human Error	D	0.02	1	Injury	PPE, SWI & Training	Low		Maintenance Department
		Portal Crane Failure	Financial	Break Failure	D	0.02	1	Asset Damage	PM Check	Low		Maintenance Department
			Financial	Wire Rope Damage	D	0.02	1	Asset Damage	PM Check	Low		Maintenance Department
			Financial	Positioning Error	A	0.05	1	Production Loss	PM Check	Medium	Explore the possibility of upgrade the System	Engineering Department
		Scrap Coil Car Failure	Financial	Mechanical Failure	E	0.01	1	Scrap Coil loading stop	PM Check	Low		Maintenance Department

			Financial	Electrical Cable Failure	C	0.03	1	Scrap Coil loading stop	PM Check	Medium	Explore the possibility of Other engineering control to avoid the Cable Damage	Engineering Department
		ASRS Crane Failure	Financial	Positioning Error	C	0.03	1	Asset Damage	No Control Measure	Medium	Establish PM check	Maintenance Department
			Financial		C	0.06	2	Production Loss	No Control Measure	Medium	Establish PM check	Maintenance Department
2	Coil Transfer from Pre-Station to OMEGA Car - HSS	OMEGA Car Failure	Financial	Mechanical failure	D	0.02	1	Coil loading stop	PM Check	Low		Maintenance Department
			Financial	Electrical Failure	D	0.02	1	Coil loading stop	PM Check	Low		Maintenance Department
3	Coil Transfer from OMEGA to HSS	Coil Car Failure	Financial	Mechanical failure	C	0.03	1	Coil loading stop	PM Check	Medium	SWI for Maintenance need to be developed for OMEGA &	Maintenance Department

											Coil Car for Both HSS & PTS (Wheel & Shaft Replacement)	
			Financial	Electrical Failure	C	0.03	1	Coil loading stop	PM Check	Medium	SWI for Maintenance need to be develop for OMEGA & Coil Car for Both HSS & PTS (Wheel & Shaft Replacement)	Maintenance Department
4	Coil Loading to De-Coiler - HSS	Coil Car Failure	Financial	Mechanical failure	C	0.03	1	Coil loading stop	PM Check	Medium	SWI for Maintenance need to be develop for Coil Car (Bearing & Shaft	Maintenance Department

											Replacem ent)	
			Financial	Electrical Failure	C	0.03	1	Coil loading stop	PM Check	Mediu m	SWI for Maintenan ce need to be develop for Coil Car (Bearing & Shaft Replacem ent)	Maintena nce Departme nt
		De Coiler Mandrel Failure	Financial	Mechanic al Failure	B	0.04	1	Coil loading stop	PM Check	Mediu m	Implement the New Design Change by Vendor	Maintena nce Departme nt
			Financial		B	0.08	2	Coil Unloadi ng Stop	PM Check	Mediu m	Implement the New Design Change by Vendor	Maintena nce Departme nt
			Financial		B	0.12	3	Asset Damage	PM Check	High	Implement the New Design Change by Vendor	Maintena nce Departme nt
5	Coil Threading to Roller	Threading Equipme nt Failure	Financial	Mechanic al Failure	C	0.03	1	Producti on Loss	PM Check	Mediu m	SWI for Maintenan ce need to be develop	Maintena nce Departme nt

6	Shear - HSS										for Belt Replacement	
			Financial	Electrical Failure	E	0.01	1	Production Loss	PM Check	Low		Maintenance Department
		Improper Scrap Handling	Health and Safety	Human Error	D	0.02	1	Injury	PPE, SWI & Training	Low		Maintenance Department
	Coil Threading Roller shear to Re-coiler - HSS	Coil Stuck at CNC Shear	Financial	Uneven Strip surface	B	0.04	1	Production Loss	No Control Measure	Medium	Develop SWI for the removal of Scrap	Operation Department
		Improper Removing & Handling the Scrap from the line	Health and Safety	Human Error	C	0.03	1	Injury	PPE, SWI & Training	Low		Maintenance Department
			Health and Safety	Slip and Trip	C	0.03	1	Injury	PPE, SWI & Training	Medium	Explore the possibility of disposing the Scrap from the platform	Engineering Department
		Oiler Machine Failure	Financial	Mechanical Failure	D	0.02	1	Production Loss	PM Check	Low		Maintenance Department

			Financial	Electrical Failure	C	0.03	1	Producti on Loss	PM Check	Mediu m	Implement the high voltage upgarding Project - PO# 63419055 92	Engineeri ng Departme nt
	Improper Oiling		Financial	High ambient Temperature & high humidity	A	0.05	1	Producti on Loss	No control Measure	High	Implement the oil auxiliary cooling project under MOC-RM-2020-9600-0270	Central Maintena nce Departme nt
			Image & Reputati on		A	0.1	2	Custom er Complai nt	No control Measure	High	Implement the oil auxiliary cooling project under MOC-RM-2020-9600-0270	Central Maintena nce Departme nt
	CNC side Trimmer failure		Financial	Mechanic al Failure	D	0.02	1	Producti on Loss	PM Check	Low		Maintena nce Departme nt

			Financial	Electrical Failure	D	0.02	1	Production Loss	PM Check	Low		Maintenance Department
		Improper CNC side Trimmer Cutting	Financial	Knife Wear & tear issue	C	0.03	1	Production Loss	Knife replacement & calibration, SWI	Low		Maintenance Department
		Improper CNC Side Trimmer knife replacement & calibration	Health and Safety	Human Error	D	0.02	1	Injury	PPE, SWI & Training	Low		Maintenance Department
		Re-Coiler Failure	Financial	Mechanical (Mandrel, Hydraulic leakage, counter bearing) Failure	C	0.03	1	Production Loss	PM Check	Medium	PM Frequency need to be improve	Maintenance Department
			Financial	Electrical Failure	D	0.02	1	Production Loss	PM Check	Low		Maintenance Department
		Mandrel Change	Financial	Mechanical Failure	D	0.02	1	Asset Damage	PM Check	Low		Maintenance

		Sequence Failure									Department
			Financial		D	0.04	2	Production Loss	PM Check	Low	Maintenance Department
			Financial	Electrical Failure	C	0.03	1	Asset Damage	PM Check	Low	Maintenance Department
			Financial		D	0.04	2	Production Loss	PM Check	Low	Maintenance Department
		Mandrel lifting Hazard	Financial	Human Error	D	0.02	1	Asset Damage	LSR, SWI & Training	Low	Maintenance Department
			Health and Safety		D	0.04	2	Injury	LSR, SWI & Training	Low	Maintenance Department
		Taping Machine Failure	Financial	Mechanical Failure	D	0.02	1	Production Loss	PM Check	Low	Maintenance Department
			Financial	Electrical Failure	D	0.02	1	Production Loss	PM Check	Low	Maintenance Department
		Spool Loading	Financial	Mechanical Failure	D	0.02	1	Production Loss	PM Check	Low	Maintenance

	Car Failure									Departme nt	
		Financial	Electrical Failure	D	0.02	1	Producti on Loss	PM check	Low		Maintena nce Departme nt
	Improper winding	Financial	Malfuncti on of Exit Guide Unit	D	0.02	1	Producti on Loss	PM Check	Low		Maintena nce Departme nt
	Card Board Spool Loading portal Crane failure	Financial	Mechanic al Failure	D	0.02	1	Producti on Loss	PM Check	Low		Maintena nce Departme nt
		Financial	Electrical Failure	D	0.02	1	Producti on Loss	PM Check	Low		Maintena nce Departme nt
	Exit Coil Car Failure	Financial	Mechanic al Failure	D	0.02	1	Producti on Loss	PM Check	Low		Maintena nce Departme nt
		Financial	Electrical Failure	D	0.02	1	Producti on Loss	PM Check	Low		Maintena nce Departme nt
	Strip Break	Financial	Input Material defect	C	0.03	1	Producti on Loss	No Control Measure	Mediu m	Input Material Quality to be improve from TCM side	Operation Departme nt

		Financial	Mechanical Failure	D	0.02	1	Production Loss	No Control Measure	Low		Maintenance Department
		Financial	Electrical Failure	D	0.02	1	Production Loss	No Control Measure	Low		Maintenance Department
	Removal of Strip Break material	Health and Safety	Human Error	D	0.02	1	Injury	SWI, PPE & training	Low		Maintenance Department
	Scrap Baller Failure	Financial	Mechanical Failure	D	0.02	1	Production Loss	PM Check	Low		Maintenance Department
		Financial	Electrical Failure	D	0.02	1	Production Loss	PM Check	Low		Maintenance Department
	Scrap Baller Overflow	Financial	Scrap Accumulation	C	0.03	1	Production Loss	No Control Measure	Medium	Complete the ongoing study to prevent the Scrap accumulation	Engineering Department
	Sample Cutting & Handling Hazard	Health and Safety	Human Error	C	0.03	1	Injury	PPE, SWI & Training	Medium	Increase awareness & training for all	Operation Department

									operation & QC staff		
	Improper Handling of Scrap	Health and Safety	Human Error	D	0.02	1	Injury	SWI, PPE & Training	Low		Mainten ance Departme nt
		Health and Safety	Same Level Fall & Trip	D	0.02	1	Injury	SWI,PP E & Training	Low		Mainten ance Departme nt
	Heat Stress	Health and Safety	High Ambient Temperature & High Humidity	D	0.02	1	Heat Related illness	Heat Preventi on Plan	Low		Mainten ance Departme nt
	Improper Scrap Bin Changing	Financial	Human Error	C	0.03	1	Asset Damage	SWI, Training	Low		Mainten ance Departme nt
	Steel Spool Unloadin g portal Crane failure	Financial	Mechanic al Failure	D	0.02	1	Producti on Loss	PM Check	Low		Mainten ance Departme nt
		Financial	Electrical Failure	D	0.02	1	Producti on Loss	PM Check	Low		Mainten ance Departme nt
	Maintena nce Hazards	Health and Safety	Oil Leakage from Hydraulic system &	C	0.03	1	Injury	PPE	Mediu m	SWI for Maintenanc e need to develop to perform a	Maintena nce Departme nt

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7	Scrap & Rework Coil Handling - HSS	Improper Handling of Rework & Scrap Coil	Health and Safety	Human Error	D	0.02	1	Injury	SWI, PPE & Training	Low		Maintenance Department
			Financial		D	0.04	2	Asset Damage	SWI, PPE & Training	Low		Maintenance Department
8	Aero Shaft Handling - HSS	Improper Aero shaft Handling	Health and Safety	Human Error	D	0.02	1	Injury	PPE, SWI & Training	Low		Maintenance Department
			Financial		C	0.06	2	Asset Damage	PPE, SWI & Training	Low		Maintenance Department
9	Assembling of HSS Knife & Rubber rings for Grinding	Improper Handling of Knife & Rubber ring	Health and Safety	Human Error	D	0.02	1	Injury	PPE, SWI & Training	Low		Maintenance Department

APPENDIX C: Table 2 (Risk Contingency Budgeting or EVM)

Node		Source of Risk	Probability		Impact cost (SAR)		EMV (SAR)	
1	Preparation Station - HSS	ASRS Coil Car Failure	B	0.04	SAR	265,000	SAR	10,600
			E	0.01	SAR	1,000	SAR	10
		CPS Entry coil Car Failure	E	0.01	SAR	1,000	SAR	10
			E	0.01	SAR	1,000	SAR	10
		DeCoiler Failure	D	0.02	SAR	1,000	SAR	20
			E	0.01	SAR	1,000	SAR	10
		Improper Coil Handling	D	0.02	SAR	2,600	SAR	52
		Heat Stress	C	0.03	SAR	50,000	SAR	1,500
		Improper Scrap Coil Handling	D	0.02	SAR	1,000	SAR	20
		Portal Crane Failure	D	0.02	SAR	1,000	SAR	20
			D	0.02	SAR	1,000	SAR	20
			A	0.05	SAR	100,000	SAR	5,000
		Scrap Coil Car Failure	E	0.01	SAR	1,000	SAR	10
			C	0.03	SAR	186,000	SAR	5,580
		ASRS Crane Failure	C	0.03	SAR	342,000	SAR	10,260
			C	0.06	SAR	257,000	SAR	15,420

2	Coil Transfer from Pre-Station to OMEGA Car -HSS	OMEGA Car Failure	D	0.02	SAR 1,000	SAR 20
			D	0.02	SAR 1,000	SAR 20
3	Coil Transfer from OMEGA to HSS	Coil Car Failure	C	0.03	SAR 62,000	SAR 1,860
			C	0.03	SAR 62,000	SAR 1,860
4	Coil Loading to De-Coiler -HSS	Coil Car Failure	C	0.03	SAR 62,000	SAR 1,860
			C	0.03	SAR 62,000	SAR 1,860
		De Coiler Mandrel Failure	B	0.04	SAR 265,000	SAR 10,600
			B	0.08	SAR 265,000	SAR 21,200
			B	0.12	SAR 387,000	SAR 46,440
5	Coil Threading to Roller Shear - HSS	Threading Equipment Failure	C	0.03	SAR 62,000	SAR 1,860
			E	0.01	SAR 1,000	SAR 10
		Improper Scrap Handling	D	0.02	SAR 1,000	SAR 20
6	Coil Threading Roller shear to Re-coiler - HSS	Coil Stuck at CNC Shear	B	0.04	SAR 62,000	SAR 2,480
		Improper Removing & Handling the Scrap from the line	C	0.03	SAR 1,000	SAR 30
			C	0.03	SAR 62,000	SAR 1,860
		Oiler Machine Failure	D	0.02	SAR 1,000	SAR 20
			C	0.03	SAR 168,000	SAR 5,040
		Improper Oiling	A	0.05	SAR 297,600	SAR 14,880
			A	0.1	SAR 297,600	SAR 29,760
		CNC side Trimmer failure	D	0.02	SAR 1,000	SAR 20
			D	0.02	SAR 1,000	SAR 20
		Improper CNC side Trimmer Cutting	C	0.03	SAR 1,000	SAR 30

		Improper CNC Side Timmer knife replacement & calibration	D	0.02	SAR 1,000	SAR 20
		Re-Coiler Failure	C	0.03	SAR 20,000	SAR 600
			D	0.02	SAR 1,000	SAR 20
		Mandrel Change Sequence Failure	D	0.02	SAR 1,000	SAR 20
			D	0.04	SAR 1,000	SAR 40
			C	0.03	SAR 1,000	SAR 30
			D	0.04	SAR 1,000	SAR 40
		Mandrel lifting Hazard	D	0.02	SAR 1,000	SAR 20
			D	0.04	SAR 1,000	SAR 40
		Taping Machine Failure	D	0.02	SAR 1,000	SAR 20
			D	0.02	SAR 1,000	SAR 20
		Spool Loading Car Failure	D	0.02	SAR 1,000	SAR 20
			D	0.02	SAR 1,000	SAR 20
		Improper winding	D	0.02	SAR 1,000	SAR 20
		Card Board Spool Loading portal Crane failure	D	0.02	SAR 1,000	SAR 20
			D	0.02	SAR 1,000	SAR 20
		Exit Coil Car Failure	D	0.02	SAR 1,000	SAR 20
			D	0.02	SAR 1,000	SAR 20
		Strip Break	C	0.03	SAR 12,000	SAR 360
			D	0.02	SAR 1,000	SAR 20
			D	0.02	SAR 1,000	SAR 20
		Removal of Strip Break material	D	0.02	SAR 1,000	SAR 20
		Scrap Baller Failure	D	0.02	SAR 1,000	SAR 20

			D	0.02	SAR 1,000	SAR 20
		Scrap Baller Overflow	C	0.03	SAR 279,000	SAR 8,370
		Sample Cutting & Handling Hazard	C	0.03	SAR 279,000	SAR 8,370
		Improper Handling of Scrap	D	0.02	SAR 1,000	SAR 20
			D	0.02	SAR 1,000	SAR 20
		Heat Stress	D	0.02	SAR 1,000	SAR 20
		Improper Scrap Bin Changing	C	0.03	SAR 1,000	SAR 30
		Steel Spool Unloading portal Crane failure	D	0.02	SAR 1,000	SAR 20
			D	0.02	SAR 1,000	SAR 20
		Maintenance Hazards	C	0.03	SAR 40,000	SAR 1,200
			C	0.06	SAR 40,000	SAR 2,400
7	Scrap & Rework Coil Handling - HSS	Improper Handling of Rework & Scrap Coil	D	0.02	SAR 1,000	SAR 20
			D	0.04	SAR 1,000	SAR 40
8	Aero Shaft Handling - HSS	Improper Aero shaft Handling	D	0.02	SAR 1,000	SAR 20
			C	0.06	SAR 1,000	SAR 60
9	Assembling of HSS Knife & Rubber rings for Grinding	Improper Handling of Knife & Rubber ring	D	0.02	SAR 1,000	SAR 20
					SAR 4,037,800	SAR 212,392