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**1. Quality Management System (QMS) / ISO 9001:2008**

The following tasks were completed using the example of a bank with operations based in Australia; the imaginary bank used here is Western Bank.

**1.1 Quality Policy For The Company**

Our Quality Policy is made with the sole motive of safety of your money and to achieve long-term relationship with our customers by delivering high quality, world-class products and services.

Towards this policy, our objectives are:

- Establishing and maintaining a quality management system in the bank for our ongoing business in accordance with ISO 9001:2008.
- Ensuring premium services to our customers by providing latest products, which add value to their banking experience.
- Continually reviewing feedback from our employees (who are our internal customers) and customers to audit our services for continuous growth and development.
- Adhering to ISO standard 27001, which assures the preservation and confidentiality of customer details, integrity and availability.
- Our employees are given continuous encouragement, motivation and training which makes them a valuable asset for our ongoing business.
- Generating value for our shareholders.

**1.2 Stakeholders and their needs.**

S.No.	Stakeholders	Needs	Processes Required To Fulfill Stakeholders' Needs
1.	Customer	User friendly & safe banking experience.	<ol style="list-style-type: none"> <li>1. Easy access to banking online system.</li> <li>2. Surveys carried out on phone &amp; email for continuous improvement.</li> <li>3. 24 x 7 complaint handling.</li> <li>4. Relationship managers who look personally into customer requirements.</li> <li>5. Three levels of safety for all types of transactions.</li> </ol>
2.	Employees	Flexible working options	<ol style="list-style-type: none"> <li>1. Continuous training given to employees in different roles.</li> <li>2. Timely leave/ maternity leave with job security.</li> <li>3. Promotions, increments &amp; bonuses.</li> <li>4. Regular HR meeting for career enhancement.</li> <li>5. Employee ombudsman.</li> </ol>

3.	Shareholder and investors	To know about the bank's financial performance & strategy for ongoing business	<ol style="list-style-type: none"> <li>1. Publishing the quarterly and annual business reports.</li> <li>2. Regular surveys being carried out to understand the shareholder's and investors' perception</li> <li>3. Conducting annual business meetings.</li> <li>4. Keeping Shareholder and investors in loop for the risks involved in the business and the measures taken.</li> <li>5. Complete history of the shares and dividends issued should be provided to customers.</li> </ol>
4.	Government	To comply with legal and regulatory aspects	<ol style="list-style-type: none"> <li>1. Having transparency in the business</li> <li>2. To comply the monetary policy with reserve bank of Australia.</li> <li>3. Process to complaint about the bank to (Australian securities and investments commission).</li> <li>4. Regular audits by government bodies.</li> <li>5. Taxable assets.</li> </ol>
5.	Communities	Free training for financial literacy.	<ol style="list-style-type: none"> <li>1. Volunteer basic financial classes by the bank employees.</li> <li>2. Increasing awareness by phone, emails &amp; group discussions.</li> <li>3. Making dummy websites for the purpose of online education.</li> <li>4. Educating people in schools.</li> <li>5. Employment prospects given to these communities.</li> </ol>

Table 1- Bank's Stakeholders' Analysis

**1.3 Identify inputs and outputs for a process**

For the “bank employees’ training” process in Section 1.2 following 10 inputs and 5 outputs were identified: -

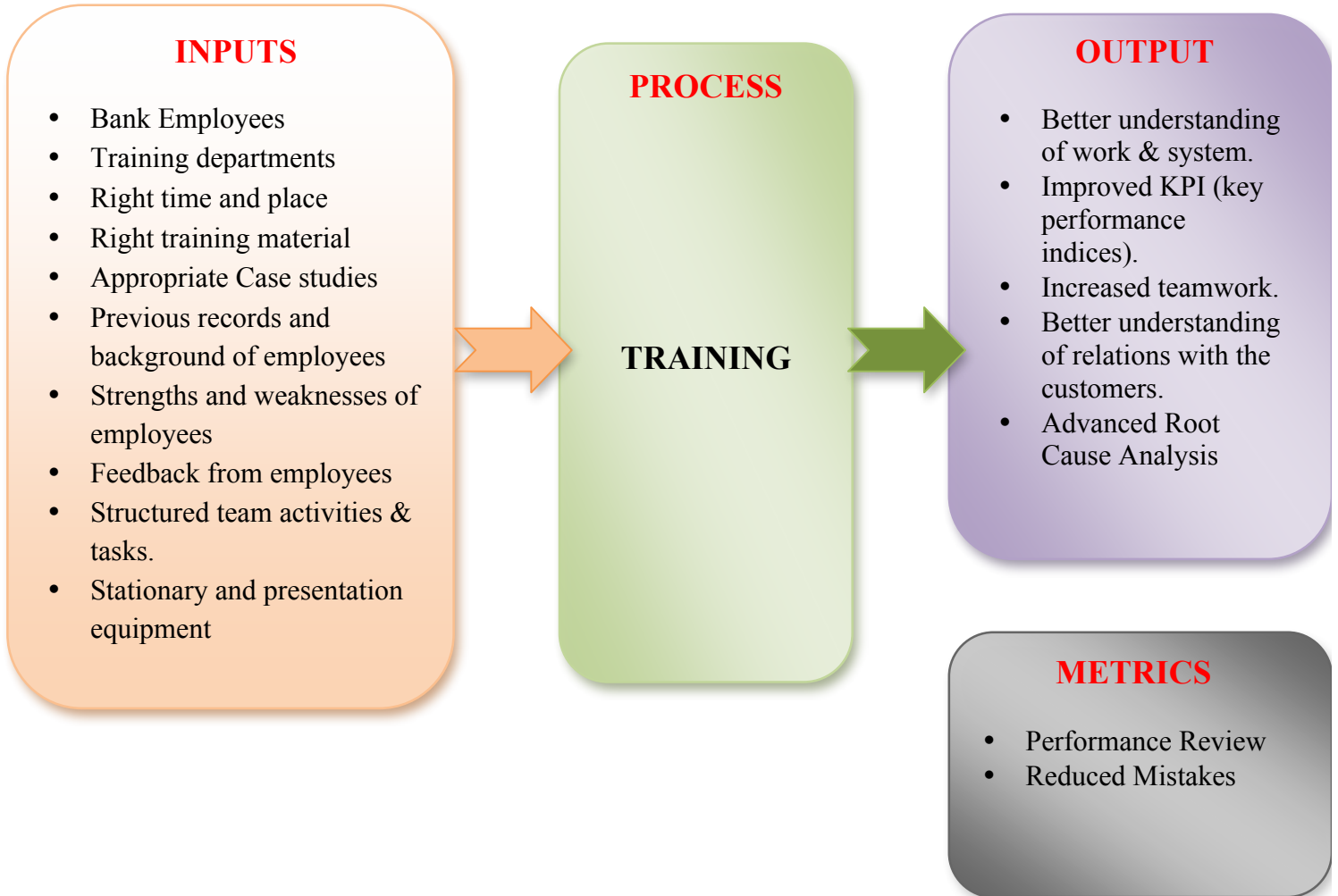


Figure 1 - Bank Employee Training Input-Process-Output Diagram

**1.4 Performance Parameters And Measurement Methods**

For the “Bank Employees training” process used in Section 1.3, following performance parameters and measurement methods could be used: -

Performance Parameters	Measurement Method(s)
Improved work efficiency	<ul style="list-style-type: none"> <li>• Appraisals from superior.</li> <li>• Reduced errors.</li> <li>• High level of confidence and self-assurance.</li> <li>• Clear work instructions at all levels.</li> <li>• Pertinent knowledge of the work being done or supervised.</li> </ul>
Improved financial health	<ul style="list-style-type: none"> <li>• Increase in number of shareholders.</li> <li>• Increase in price of stocks.</li> <li>• Increased profitability.</li> <li>• Better liquidity.</li> <li>• Less debt accounts.</li> </ul>
Customers	<ul style="list-style-type: none"> <li>• Market shares</li> <li>• Increased number of new accounts.</li> <li>• Increased number of complaint handling.</li> <li>• Customer attention.</li> <li>• Interest income.</li> </ul>
Competition	<ul style="list-style-type: none"> <li>• Surveys and feedback.</li> <li>• Employee satisfaction and long-term association.</li> <li>• Positive reports from auditors.</li> </ul>
Implementation of advanced techniques and services provided.	<ul style="list-style-type: none"> <li>• High rate of car and home financing from the bank.</li> <li>• Number of health and medical policies sold.</li> </ul>

*Table 2 - Performance Parameters And Measurement Methods*

### 1.5 Key Elements For Continuous Improvement

Key elements for continuous improvement are as follows: -

#### Training

Trainings given to the employees at every level equips them with the tools which they can use for the work assigned to them in a innovative and creative way with keeping in mind all the legislation and quality as their prime motive.

### **Risk Assessment And Internal Audits**

With risk assessment, analysts can predict the future of the market and the investments on behalf of customers and bank could be regulated so that more profits can be generated. Regular audits determine all the jobs are carried out in accordance with the procedures and quality management system is being followed.

### **Customer Satisfaction**

Regular feedback and surveys is the key to know if the customers are satisfied. This is done on regular basis on phone calls, emails and meeting them personally and then analyzed and implemented as required.

### **Internal Retrospectives**

Timely and regular retrospectives internally would help in understanding the processes that hinder employees' efficiency. Such practices also make employee pain-points visible for the higher management and enable them to take decisions based on the same. This inculcates an employee friendly culture and improves employee satisfaction.

### **Continuous Feedback**

All teams within the bank should follow the process of continuous feedback. Constructive feedback should be taken with spirit and positive feedback should be rewarded. This improves the employee well being and hence encourages them to work efficiently.

## **2. Environmental Management System (EMS) / ISO 14001:2004**

The following tasks were completed using the example of a Printing Company with operations based in Australia.

**2.1 Legislations pertaining to printing industry.**

Generic

- The Protection Of the Environment Operations act 1997 (POEO act)
- Section 120 (POEO act) - Water Pollution
- Sections 124 – 126 (POEO act) - Air Pollution
- Section 143 (POEO act) - Land Pollution
- Section 139 & 140 (POEO act) - Noise Pollution
- Waste avoidance and resource recovery act 2001.
- As 1940 – 2004 – storage and handling of flammable and combustible liquids.

Specific

- Section 129 of POEO act – Air Pollution  
*Printing premises licensed by the EPA (Environment Protection Authority) should not be the cause of or allow any offensive odours to be emitted from the premises.*
- Section 116 of POEO act – Land Pollution  
*Printing premises should not be responsible (willfully or negligently) for any kind of accidental substance (ink/toner) spills or leaks that harm the environment.*
- Waste avoidance and resource recovery act 2001.  
*Disposal of printing residue/waste safely and lawfully.*  
*Reduce environmental harm by managing waste from most desirable to the least desirable.*

**2.2 Stakeholders and their needs**

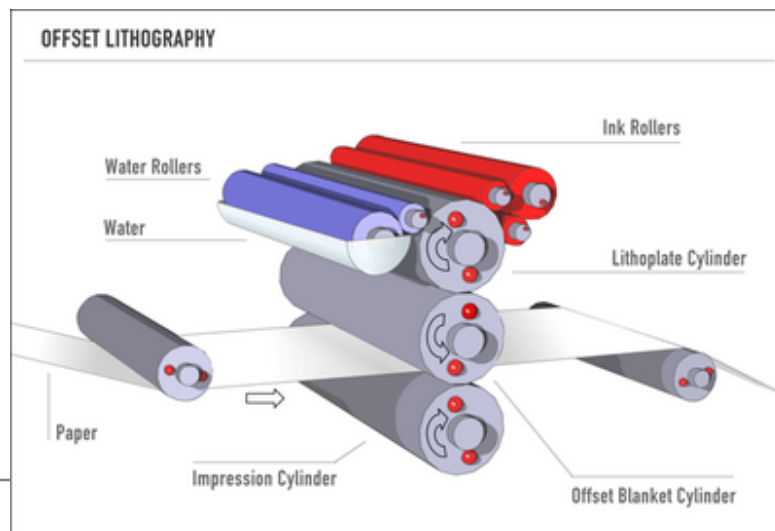
S.No.	Stakeholders	Needs
1.	Government	<ul style="list-style-type: none"> <li>• <b>Law Abiding:</b> The ongoing business should comply with local rules and legislations.</li> </ul>



		<ul style="list-style-type: none"> <li>• <b>Tax Contribution:</b> The taxes should be paid timely and correctly.</li> </ul>
2.	Employees	<ul style="list-style-type: none"> <li>• <b>Growth:</b> To create an environment that would encourage growth and learning.</li> <li>• <b>Safety:</b> To create a safe and secure working environment.</li> <li>• <b>Salary:</b> Regulated and streamlined salary structure.</li> </ul>
3.	Customers	<ul style="list-style-type: none"> <li>• <b>Time Compliance:</b> The orders should be completed in stipulated time frame.</li> <li>• <b>Quality:</b> The price and quality should be in correct proportion.</li> </ul>
4.	Suppliers	<ul style="list-style-type: none"> <li>• <b>Manage Inventory:</b> Orders should be placed at appropriate time &amp; in right quantity.</li> <li>• <b>Timely Payments:</b> The accounts receivable should not be prolonged.</li> </ul>
5.	The Community	<ul style="list-style-type: none"> <li>• <b>Environment:</b> The environment should be least affected by the operations. Noise, land, water and air pollution should be minimal and should comply to safety standards.</li> <li>• <b>Employment:</b> It should give provide employment opportunities &amp; finished products so that people don't have to travel long distances.</li> </ul>
6.	Media	<ul style="list-style-type: none"> <li>• <b>True Claim:</b> The Company should project a true picture of their products to media.</li> <li>• <b>Uphold Contracts:</b> Contracts and their terms should be upheld legally and morally.</li> </ul>

Table 3- Stakeholders Analysis

2.3 Processes



Processes & Sub-Of A Printing Organization

Figure 2 – Lithographic Printing Process

Processes and sub-processes that describe the operations of a *lithographic* printing process are as follows: -

S.No.	Processes	Sub-Processes
1	Raw Material Procurement	<ul style="list-style-type: none"> <li>• <b>Supplier Management</b> <ul style="list-style-type: none"> <li>○ Creation of timely requests and schedules for Raw Material procurement.</li> </ul> </li> <li>• <b>Inventory Management</b> <ul style="list-style-type: none"> <li>○ Creation of proper inventories for ink, solvent and paper procurement.</li> <li>○ Creation and maintenance of inventories of all assets within the Press like machinery, printing plates, etc.</li> </ul> </li> </ul>
2	Plate making	<ul style="list-style-type: none"> <li>• <b>Cylinder Clean-Up</b> <ul style="list-style-type: none"> <li>○ Removal of any residual ink from a previous job to avoid stains and ink blotches.</li> </ul> </li> <li>• <b>Job Preparation</b> <ul style="list-style-type: none"> <li>○ Preparation of the print drum before the actual printing process starts</li> </ul> </li> </ul>
3	Solvent Management	<ul style="list-style-type: none"> <li>• <b>Purchase</b> <ul style="list-style-type: none"> <li>○ Solvent purchased should be of high quality, so as to have minimal negative effect on the environment and maximum print value.</li> </ul> </li> <li>• <b>Disposal</b> <ul style="list-style-type: none"> <li>○ Proper disposal procedures should be followed in compliance with regulations.</li> </ul> </li> </ul>
4	Printing and Drying	<ul style="list-style-type: none"> <li>• <b>Mixing</b> <ul style="list-style-type: none"> <li>○ Proper mixing techniques ensure high quality printed output with low waste/ residual ink.</li> </ul> </li> <li>• <b>Stock control and storage management</b></li> </ul>

		<ul style="list-style-type: none"> <li>○ Proper storage facility and procedures should be used to store ink, solvents and printed end product so as to reduce losses due to natural causes like rain, humidity, fire etc.</li> </ul>
5	Collation	<ul style="list-style-type: none"> <li>• <b>Cutting</b> <ul style="list-style-type: none"> <li>○ Removal of margins to create bind able end product.</li> </ul> </li> <li>• <b>Binding</b> <ul style="list-style-type: none"> <li>○ Final binding of the printed end product to create a deliverable.</li> </ul> </li> </ul>
6	Waste Management	<ul style="list-style-type: none"> <li>• Proper disposal of solid, liquid and volatile waste.</li> <li>• Machine oil and grease disposal.</li> </ul>
7	Cost Management	<ul style="list-style-type: none"> <li>• Timely audits.</li> <li>• Purchase and Profit Management.</li> </ul>

Table 4 – Lithographic Printing Processes

**2.4 Environmental aspects of the above processes**

S.No	Processes	Environmental Aspects
1	Printing and Drying	<ul style="list-style-type: none"> <li>• <b>Solvent Use:</b> Air pollution from evaporation of organic solvents mainly inks and chemicals used in printing</li> </ul>

		<p>industry, which contains voc (volatile organic compounds) and Volatile toxins emitted from proofing system solvents.</p> <ul style="list-style-type: none"> <li>• <b>Wash Water Use:</b> Water pollution from wastewater, which has been used in the Plate development process.</li> <li>• <b>Oil and Grease Use:</b> Used activators, machine oil and grease spillage could percolate to the ground leading to land pollution and ground water pollution.</li> <li>• <b>Solid Waste:</b> Land pollution from empty containers, out dated materials, empty aerosol cans, worn out printing plates etc.</li> <li>• <b>Moving Machine Parts:</b> Noise pollution which could cause from the ongoing process is an important environmental issue</li> <li>• <b>Energy Rating:</b> Emissions from the machines contributes to global warming and ozone layer depletion.</li> </ul>
2	Waste Management	<ul style="list-style-type: none"> <li>• <b>Paper Use:</b> <ul style="list-style-type: none"> <li>• Incineration of printed-paper can be carcinogenic in nature jeopardizing the well being of the community.</li> </ul> </li> <li>• <b>Plate Making:</b> <ul style="list-style-type: none"> <li>• Developer, replenisher and finishing solutions used in plate making can contaminate ground water reserves and cause land pollution</li> </ul> </li> <li>• <b>Press Maintenance:</b> <ul style="list-style-type: none"> <li>• Waste blanket, ink, metal strips, impression paper etc can cause land pollution and release hazardous compounds in the air.</li> </ul> </li> <li>• <b>Ink Use:</b> <ul style="list-style-type: none"> <li>• Inks, imaging agents and solvents can cause VOC emissions, adversely affecting the health of workers and the community.</li> </ul> </li> <li>• <b>Liner Use:</b> <ul style="list-style-type: none"> <li>• Liner and coating materials used contain alcohol proportions, which if not treated, can cause hazardous emissions.</li> </ul> </li> </ul>

Table 5 – Environmental Aspects

**2.5 Environmental impacts of the above processes**

S.No	Processes	Environmental Impact
1	Printing and Drying	<ul style="list-style-type: none"> <li>• <b>Solvent Use:</b> <ul style="list-style-type: none"> <li>• Air pollution - volatile organic compounds aid smog</li> </ul> </li> </ul>

		<p>formation and act as lung irritant by creating an ozone layer in the lower atmosphere. This is formed when VOCs react with nitrogen oxides in the presence of sunlight.</p> <ul style="list-style-type: none"> <li>• Water pollution – Solvents, if not stored and disposed properly, can seep into the ground contaminating the ground water.</li> <li>• <b>Wash Water Use:</b> <ul style="list-style-type: none"> <li>• Water Pollution – Untreated wash water released into larger water bodies leads to adverse effect on the aquatic eco-system.</li> <li>• Ground water pollution can effect civilizations depending on ground water as a source of consumable water.</li> </ul> </li> <li>• <b>Oil and Grease Use:</b> <ul style="list-style-type: none"> <li>• Used oil and grease residue can percolate into the land rendering it barren.</li> <li>• This can adversely affect any life that thrives in the locality.</li> </ul> </li> <li>• <b>Solid Waste:</b> <ul style="list-style-type: none"> <li>• This can lead to destruction of habitats.</li> <li>• Creation of landfills and wastage of land resources.</li> </ul> </li> <li>• <b>Moving Machine Parts:</b> <ul style="list-style-type: none"> <li>• Noise pollution from various moving parts of the machinery used in printing.</li> <li>• Air Pollution from particulate matter release during the printing process and ink sprays.</li> </ul> </li> <li>• <b>Energy Rating:</b> <ul style="list-style-type: none"> <li>• Climatic Change from depletion of the ozone layer and global warming.</li> <li>• Adverse effect on life due to above stated climatic change over time.</li> </ul> </li> </ul>
2	Waste Management	<ul style="list-style-type: none"> <li>• <b>Paper Use:</b> <ul style="list-style-type: none"> <li>• Carcinogenic in nature, this can adversely affect the health of workers and the community.</li> <li>• Incineration of waste paper results in air pollution.</li> </ul> </li> <li>• <b>Plate Making:</b> <ul style="list-style-type: none"> <li>• Ground water reserves can get contaminated if plate-making solutions are not stored and disposed off properly.</li> <li>• Spillage of solutions can cause land pollution</li> </ul> </li> <li>• <b>Press Maintenance:</b> <ul style="list-style-type: none"> <li>• Waste blankets and metal strips cause land pollution since they cannot be completely disposed/ recycled.</li> </ul> </li> </ul>

		<ul style="list-style-type: none"> <li>• Compounds used in impression paper can release hazardous compounds in the air leading to air pollution.</li> <li>• <b>Ink Use:</b> <ul style="list-style-type: none"> <li>• VOC emissions can cause lung irritation and lead to adverse effects on employee health.</li> <li>• Inks, imaging agents can cause land and water pollution.</li> </ul> </li> <li>• <b>Liner Use:</b> <ul style="list-style-type: none"> <li>• Volatile coating materials can cause emissions that can be hazardous to the health of the community and livestock.</li> <li>• Alcohols and solvents used in liners can cause water pollution.</li> </ul> </li> </ul>
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Table 6 – Environmental Impacts

**2.6 Objectives For Environmental Aspects**

S.No	Environmental Aspect	Objectives
1.	Solvent use	<ul style="list-style-type: none"> <li>• Reduce the use of voc (volatile organic compounds)</li> <li>• Implementation of lean production in the process to reduce wastage.</li> <li>• Job planning</li> </ul>
2.	Wash water use	<ul style="list-style-type: none"> <li>• Implementation of new methods to reduce the wash</li> </ul>

		<p>water.</p> <ul style="list-style-type: none"> <li>• Change in printing technology.</li> </ul>
3.	Oil and Grease Use	<ul style="list-style-type: none"> <li>• Keeping the machines in sound working conditions.</li> <li>• Use of right disposal methods.</li> <li>• Keeping the record of usage and wastage.</li> </ul>
4.	Solid waste	<ul style="list-style-type: none"> <li>• Correct disposal of the waste.</li> <li>• Implementation of segregation of the various kinds of wastes produced</li> </ul>
5.	Moving machine parts (noise pollution)	<ul style="list-style-type: none"> <li>• Use of low noise machineries</li> <li>• Use of engineering controls which are fitted externally to reduce noise levels.</li> <li>• Regular servicing and inspection of machinery parts by trained professionals.</li> <li>•</li> </ul>
6.	Energy rating	<ul style="list-style-type: none"> <li>• Use of correct procedures to reduce losses from machineries</li> <li>• Training the employees for correct operations in the press.</li> </ul>
7.	Paper use	<ul style="list-style-type: none"> <li>• Reduce the use of paper in the process</li> </ul>
8.	Plate making	<ul style="list-style-type: none"> <li>• Use of alternative technologies</li> </ul>
9.	Press maintenance	<ul style="list-style-type: none"> <li>• Regular plant maintenance system to be followed</li> </ul>
10.	Ink use	<ul style="list-style-type: none"> <li>• Alternative to traditional inks containing voc to be used.</li> </ul>
	Liner use	<ul style="list-style-type: none"> <li>• Minimize the use</li> <li>• Alternatives to liner and coating materials to be used.</li> </ul>

Table 7 – Objectives for Environmental Aspects

**2.7 Targets For Above Objectives**

S.No	Environmental Aspect	Objectives	Targets
1.	Solvent use	<ul style="list-style-type: none"> <li>• Reduce the use of voc (volatile organic compounds)</li> </ul>	Saving 1 - 2 tonnes of volatile organic compounds (VOC) being released to atmosphere per year.
		<ul style="list-style-type: none"> <li>• Implementation of lean</li> </ul>	

		production in the process to reduce wastage.	
		Job planning	
2.	Wash water use	<ul style="list-style-type: none"> <li>Implementation of new methods to reduce the wash water.</li> </ul>	Reduce water usage between 10,000 - 20,000 Liters of water per shift which amounts to 82.5% savings
		<ul style="list-style-type: none"> <li>Change in printing technology.</li> </ul>	
3.	Oil and Grease Use	<ul style="list-style-type: none"> <li>Minimize the usage</li> <li>Implementation of lean production in the process to reduce wastage.</li> </ul>	No pollution from oil and grease.
4.	Solid waste	Job planning	No waste accepted
5.	Moving machine parts (noise pollution)	<ul style="list-style-type: none"> <li>Use of low noise machineries.</li> </ul>	Peak sound pressure levels between 85 db(A) to 140 db(A) to be maintained
		<ul style="list-style-type: none"> <li>Use of engineering controls which are fitted externally to reduce noise levels.</li> </ul>	
		<ul style="list-style-type: none"> <li>Regular servicing and inspection of machinery parts by trained professionals.</li> </ul>	
6.	Energy rating	<ul style="list-style-type: none"> <li>Use of correct procedures to reduce losses from machineries</li> </ul>	Should be minimized as much as possible
		<ul style="list-style-type: none"> <li>Training the employees for correct operations in the press.</li> </ul>	
7.	Paper use	<ul style="list-style-type: none"> <li>Reduce the use of paper in the process</li> </ul>	The waste generated should be reduced to 50% .
8.	Plate making	<ul style="list-style-type: none"> <li>Use of alternative technologies</li> </ul>	Reduction in wastage to 95%
9.	Press maintenance	<ul style="list-style-type: none"> <li>Regular plant maintenance system to be followed</li> </ul>	Regularly for the optimum use.
10.	Ink use	<ul style="list-style-type: none"> <li>Alternative to traditional inks containing voc to be used.</li> </ul>	Method Reduced the ink consumption to 30 %
11.	Liner use	<ul style="list-style-type: none"> <li>Minimize the use</li> </ul>	The waste generated to be reduced to 70% by 2019-20
		<ul style="list-style-type: none"> <li>Alternatives to liner and coating</li> </ul>	



		materials to be used.	
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Table 8 - Targets

**2.8 Actions To Be Taken For The Targets**

S.No	Environmental Aspect	Targets	Actions
1.	Solvent use	Saving 1 - 2 tonnes of volatile organic compounds (VOC) being released to atmosphere per year.	While using oil or alcohol based solvents effective solvent recovery methods should be implemented.
			Use of wipes, squeezing bottles instead of rags. if rags being used they should be stored in air tight bins or containers.
2.	Wash water use	Reduce water usage	Use of newer technology in printing like

		between 10,000 - 20,000 Liters of water per shift which amounts to 82.5% savings	computer to plate technology (CTP) To lower the amount of wastewater generated printing technology use of high pressure washing equipment should be propagated.
3.	Oil and Grease Use	No pollution from oil and grease.	Use of drip tray to contain the oil and grease dripping from machinery MSDS of the product to read and understood and the waste oil and grease should be disposed off to lessened persons
4.	Solid waste	No waste accepted	Garbage segregation to be followed strictly. The plant follows waste reduction methods and policies.
5.	Moving machine parts (Noise pollution)	Peak sound pressure levels between 85 db (A) to 140 db (A) to be maintained	Retrofitting the Existing Equipments to reduce the noise levels to the desired limits The machineries should be designed in such a way that noise levels are already dampened.
6.	Energy rating	Should be minimized as much as possible	The design should be such that it consumes minimum power. The heat generated as a result of the printing process should reduced by applying the engineering control.
7.	Paper use	The waste generated should be reduced to 50% .	Use of newer technology in printing like computer to plate technology (CTP), which reduces the paper consumption. Similar jobs should be carried out back to back to reduce wastage.
8.	Plate making	Reduction in wastage to 95%	Implementation of newer technologies which reduces the wastage like direct-to-plate technology The used up or broken plates should be sold to recycler.
9.	Press maintenance	Regularly for the optimum use.	A professional should carry out the servicing and routine maintenance timely. Any abnormality should be immediately rectified
10.	Ink use	Method Reduced the ink consumption to 30 %	Alternative inks which are VOC free, non petroleum based should be used like soy vegetable, water based, and waterless inks Use of newer technology in printing like computer to plate technology (CTP) shows a drastic reduction in ink levels.
11.	Liner use	The waste generated to be reduced to 70% by	Implementation of lean technology in the process.

		2019-20	Right separation and disposal of waste produces.
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Table 9 – Actions to be taken for the targets

**2.9. Methods To Monitor The Progress Of Implementation Of Environmental Actions**

S.No	Environmental Aspect	Actions	Methods To Monitor The Progress
1.	Solvent use	While using oil or alcohol based solvents effective solvent recovery methods should be implemented.	Reduction in consumption of traditional solvents
			Workers health condition enhanced.
			Reduction in the VOC emissions
			Reduction in odour from alcohol emissions
		Use of wipes, squeezing bottles instead of rags. If rags being used they	Encouraging re-use.
			Less garbage production
			Clean working atmosphere
			Less rags consumption

		should be stored in air tight bins or containers.	Garbage recycling/disposal times reduced
			Use of wipes and cleaning liquids increased
2.	Wash water use	Use of newer technology in printing like computer to plate technology (CTP)	Water consumption reduced.
			Enhanced work efficiency
			Less manual labor
			Reduced cost of overall process of production
			Improved quality of end product
		To lower the amount of wastewater use of high pressure washing equipment should be propagated.	Water consumption reduced.
			Wastewater quantity reduced.
			Reduction in council water bills.
Reduced cost of overall production			
		Effective usage of water as a resource.	
3.	Oil and Grease Use	Use of drip tray to contain the oil and grease dripping from machinery	Reduction in unwanted spills
			Oil and grease consumption reduced by reducing the wastage
			Easy reorganization of faults and breakdowns
			Single disposal point per unit.
			Reduced effort in collection from different sources of drips.
		MSDS of the product to read and understood and the waste oil and grease should be disposed off to lessened persons	Quick and actions taken in case of emergencies.
			Sound Knowledge of the product contents
			Safe disposal
			Reduction of hazardous waste.
			Containment of health hazard
4.	Solid waste	Garbage segregation to be followed strictly.	Recycled products can be easily collected and separated.
			Easy to transfer to designated locations
			Processing of garbage faster
			Effect on health and environment reduced.
			Garbage disposal legislation followed easily.
		The plant follows waste reduction methods and policies.	The employees get clear picture of the processes followed by the company.
			The overall cost for the printing process is reduced
			Working environment healthy for the

			employees.
			The printing process becomes faster
5.	Moving machine parts (Noise pollution)	Retrofitting the Existing Equipments to reduce the noise levels to the desired limits	Reduction in noise produced from machine.
			Efficiency and concentration level of workers increased
			Less miscommunication and misunderstanding in work.
			Work Stress reduced and Hearing problems related to work reduced.
			Regular audits and noise level checks.
		The machineries should be designed in such a way that noise levels are already dampened.	Noise level reduced.
			Efficiency and concentration level of workers increased
			Less miscommunication and misunderstanding in work.
			Work Stress reduced and Hearing problems related to work reduced.
			Regular audits and noise level checks.
6.	Energy rating	The design should be such that it consumes minimum power.	Overall industrial productivity and efficiency
			Engineering design.
			Regular servicing and inspection of the machines by trained professionals.
			External audits
			Reduction in energy prices.
		The heat generated as a result of the printing process should reduce by applying the engineering control.	Overall industrial productivity and efficiency.
			Engineering design.
			Keeping the temperature of work place as low as possible.
			External audits
			Regular servicing and inspection of the machines by trained professionals.
7.	Paper use	Use of newer technology in printing like computer to plate technology (CTP), which reduces the paper consumption.	Overall plant efficiency increase.
			Reduction in operating cost of plant process.
			Regular audits and checks
			More precise job as most of the work done of by computer
			Less human intervention.
		Similar jobs should be	Enhanced output.

		carried out back to back to reduce wastage.	Fewer chances of faults. Reduced wastage. Less time taken to complete the job. Less chance of human mistakes.		
8.	Plate making	Implementation of newer technologies which reduces the wastage like direct-to-plate technology	Precise work. Less wastage. Manual labor reduced. Overall cost for the printing process reduced. Improved profits due to improved quality of print.		
			The used up or broken plates should be sold to recycler.	Reduction in Storage of scrap plates. Generates revenue by selling of scrap. The scrap disposed or recycled correctly in accordance with environmental laws. Scrap re-used for the benefit of the community. Regular audits into amount of scarp disposed.	
				A professional should carry out the servicing and routine maintenance timely.	Fewer breakdowns in plants. Increased productivity. External audits easily passed with any nonconformity. All the printing press processes comply will all the legal legislations. Timely completion of the work orders.
					Any abnormality should be immediately rectified
		Ink use		Alternative inks which are VOC free, non petroleum based should be used like soy vegetable, water based, and waterless inks	
			Use of newer technology in printing like computer		Reduced health hazards to workers. Less pollution to the environment.

		to plate technology (CTP) shows a drastic reduction in ink levels.	It has pleasant fragrance as compared to high voc based inks.
			Disposal of these paints is simple compared to high voc based.
			Compliance with the legislations.

Table 10 – Methods to monitor progress

### 3. Occupational Health & Safety Management System (OHSMS) / AS 4801:2001

The following tasks were completed using the example of a university in Australia (New South Wales)

#### 3.1 Legislative Requirements

The following are state (New South Wales) legislations

##### *Generic Legislations*

- Pesticides Act 1999
- Public Health Act 1991
- Smoke-free Environment Act 2000
- Smoke-Free Environment Regulation 2000
- Food Act 2003

- Industrial Relations Act 1996
- Gene Technology Act 2003
- Ozone Protection Act 1989
- Workers Compensation Act 1987
- Workers Compensation Legislation Amendment Act 2000
- Workplace Injury Management and Workers Compensation Act 1998

***Specific Legislations***

- Work Health and Safety Regulation 2011
- Work Health and Safety Act 2011

The following are federal legislations

- Gene Technology Act 2000
- Industrial Chemicals Act 1989

**3.2 Risks Involved In Universities Are As Follows**

S. No.	RISKS INVOLVED	EXPLANATION
1.	<b>Slips and trips</b>	This situation could arise due to the following: <ul style="list-style-type: none"> <li>• Poor house keeping</li> <li>• Obstructions on the walking ways</li> <li>• Wet floors</li> <li>• Inadequate lighting</li> <li>• Improper Handrails</li> </ul> This situation could lead to : <ul style="list-style-type: none"> <li>• Minor injuries like burses, cuts</li> <li>• Major injuries like broken bones, ankle twists, back injuries. Sometimes this can lead to permanent damage and incapacity to work in future.</li> </ul>
2.	<b>Noise</b>	The loud noise could arise from: <ul style="list-style-type: none"> <li>• Any kind of device which produce noise levels more than</li> </ul>



		<p>85 decibel</p> <ul style="list-style-type: none"> <li>Noise, which arise from nearby construction sites.</li> <li>Refurnishing or fabrication in the buildings.</li> </ul> <p>This situation could lead to :</p> <ul style="list-style-type: none"> <li>Permanent hearing loss</li> <li>Interference in work or classes</li> <li>Misunderstandings and miscommunications</li> </ul>
3.	<b>Smoking (Passive or active)</b>	<p>The smoke from smoking can arise from:</p> <ul style="list-style-type: none"> <li>Active smokers</li> </ul> <p>The active or passive smoking can lead to:</p> <ul style="list-style-type: none"> <li>Fire</li> <li>Breathing problems.</li> <li>Lung cancer.</li> <li>Smoke Affect Pregnancy</li> </ul>
4.	<b>Communicable diseases</b>	<p>Communicable diseases can arise from:</p> <ul style="list-style-type: none"> <li>Indirect way, the common areas that are liable to come in contact. Example: door handles, taps, tables</li> <li>Directly from person to person Example: coughing, handshake, sex</li> </ul> <p>Communicable diseases can lead to:</p> <ul style="list-style-type: none"> <li>Infections / death due to diarrheal diseases, lower respiratory infections (flu), sexually transmitted diseases, tuberculosis.</li> </ul>
5.	<b>Fire</b>	<p>Fire can arise from:</p> <ul style="list-style-type: none"> <li>Electrical short circuit</li> <li>Smoking</li> <li>Accidentally</li> </ul> <p>Fire can lead to:</p> <ul style="list-style-type: none"> <li>Damage to property</li> <li>Asphyxia</li> <li>Burn injuries</li> <li>Deaths</li> </ul>
6.	<b>Ergonomics</b>	<p>It can happen from:</p> <ul style="list-style-type: none"> <li>Improper seating on work stations</li> <li>Architectural design and ventilation of work area.</li> </ul> <p>It can lead to:</p> <ul style="list-style-type: none"> <li>Posture related problems Example: back, neck, head pains</li> </ul>

		<ul style="list-style-type: none"> <li>• Particulate inhalation.</li> <li>• Eye fatigue</li> </ul>
7.	<b>Bullying and harassment</b>	<p>It can happen from:</p> <ul style="list-style-type: none"> <li>• Illicit behavior towards a person</li> <li>• Sending disturbing messages through electronic media</li> <li>• Discrimination based on color,, religion, gender, orientation etc.</li> </ul> <p>It can lead to:</p> <ul style="list-style-type: none"> <li>• Depression</li> <li>• Suicide</li> <li>• If no proper channel of report and complaint exists it can lead to increase in such behavior</li> </ul>
8.	<b>Manual handling</b>	<p>The manual handling situation arises from:</p> <ul style="list-style-type: none"> <li>• Moving, pushing, pulling and lifting heavy objects.</li> </ul> <p>Example: moving books and file, furniture, equipment, trolleys etc</p> <p>Manual situation can lead to:</p> <ul style="list-style-type: none"> <li>• Unexpected events like Cuts, bruises, fractures etc</li> <li>• Damage to musculoskeletal system of the body</li> <li>• Could lead to disorders in upper and lower limbs, back pain and injuries.</li> </ul>
9.	<b>Lighting and air conditioning</b>	<p>Lighting and quality of air arises from:</p> <ul style="list-style-type: none"> <li>• The lighting arrangement used in lit up the institution</li> <li>• The air conditioning arrangement used by the institution</li> </ul> <p>Problems from Lighting and quality of can lead to:</p> <p>Lighting</p> <ul style="list-style-type: none"> <li>• Effects people’s mood and motivational levels as the light absorbed by the eyes has direct effect on persons bodies physical condition.</li> </ul> <p>Air conditioning</p> <ul style="list-style-type: none"> <li>• Respiratory problems it arises from the growth of microorganisms and mold due to condensation present on the cooling coils.</li> </ul>

		<ul style="list-style-type: none"> <li>• Spread diseases due to indoor air contamination</li> <li>• Could be carrier of infections at the place.</li> </ul>
10.	<b>Electrification</b>	<p>Electrification is the process of generation, transmitting, distribution and use electricity</p> <p>Electrification might lead to</p> <ul style="list-style-type: none"> <li>• Electric shocks which can lead to burns injuries, injuries to person and in extreme cases death.</li> <li>• Short circuit can lead to electrical fires, which might cause damage to property and life.</li> </ul>

Table 11 – Risks Involved In Universities

### 3.3 Risk Assessment Chart

#### Risk Assessment Calculator

LIKELIHOOD ↓	CONSEQUENCES				
	Catastrophic 5	Major 4	Moderate 3	Minor 2	Insignificant 1
Almost certain 5	10	9	8	7	6
Likely 4	9	8	7	6	5
Possible 3	8	7	6	5	4
Unlikely 2	7	6	5	4	3
Rare 1	6	5	4	3	2

Figure 3 - Shows the risk assessment calculator used by Queensland University of Technology Brisbane, Australia for Generic Risk Assessment Record. It is used to calculate the risk score system and determine the severity and corrective actions.

CONSEQUENCES RATING:

The aim of consequence rating is to gauge the severity of harm caused to property or person.

<i>Consequence rating</i>	<i>Level of harm</i>	<i>Outcome</i>	<i>Cost category</i>
5	Catastrophic	Leads to death or serious injuries which might cause disabilities and might cause disaster to the environment	Huge cost
4	Major	Leads to Serious injuries or extensive injuries and could cause severe damage to the environment.	Major cost
3	Moderate	Medical attention required by injured person and environmental impact could be contained	High cost
2	Minor	Can be treated by giving medical first aid and little impact to environment	Medium cost
1	Insignificant	No injuries incurred and no impact to environment	Low cost

Table 12 – Consequences Rating

*LIKELIHOOD RATING*

It tells how often the accident has taken place. The occurrence of accident is analysed by the previous records of accidents.

<i>Likelihood rating</i>	<i>Occurrence period</i>	<i>Criteria</i>
5	Almost Certain	It takes place in most of the circumstances
4	Likely	Will occur probably
3	Possible	Might occur
2	Unlikely	Very rare occurrence
1	Insignificant	Has occurred in exceptional circumstances

Table 13 – Likelihood Rating

*RISKS SCORES AND ITS IMPACT*

The risk scores are calculated from risk assessment calculator by adding consequences rating and likelihood rating. The table below shows the impact ratings for the scores calculated

<i>Calculated Risk score</i>	<i>Impact rating</i>	<i>Corrective actions</i>
9-10	Extreme	Work cannot be performed , requires Immediate corrective action
7-8	High	Corrective Action plan will be required, corrective action required
5-6	Moderate	Specific monitoring required, management responsibility must be specified
2-4	Low	The job can still be Managed through routine procedures

Table 14 – Risks Scores And Its Impact

RISK ASSESSMENT CHART

<i>RISK DESCRIPTION</i>	<i>CONSEQUENCES RATING</i>	<i>LIKELIHOOD RATING</i>	<i>IMPACT RATING (CONSEQUENCES RATING + LIKELIHOOD RATING)</i>
<b>Slips And Trips</b>	5	4	9
	CATASTROPHIC	LIKELY	EXTREME
<b>Noise</b>	3	3	6
	MODERATE	POSSIBLE	MODERATE
<b>Smoking</b>	4	4	8
	MAJOR	LIKELY	HIGH
<b>Communicable Diseases</b>	3	4	7
	MODERATE	LIKELY	HIGH
<b>Fire</b>	5	5	10
	CATASTROPHIC	ALMOST CERTAIN	EXTREME
<b>Ergonomics</b>	4	2	6
	MAJOR	UNLIKELY	MODERATE
<b>Bullying And Harassment</b>	5	3	8
	MAJOR	POSSIBLE	HIGH
<b>Manual Handling</b>	3	4	7
	MODERATE	LIKELY	HIGH
<b>Lighting And Air Conditioning</b>	3	2	5
	MODERATE	UNLIKELY	MODERATE

<b>Electrification</b>	5	4	9
	CATASTROPHIC	LIKELY	EXTREME

Table 15 – Risk Assessment Chart

**3.4 Risks Reducing Methods**

<b>RISKS INVOLVED</b>	<b>CONTROL MEASURES</b>
Slips and trips	<ul style="list-style-type: none"> <li>• Adequate lighting in all the areas should be provided.</li> <li>• Liquid spills &amp; other hazards which might cause slip or trip should immediately be fixed</li> <li>• People should be advices to wear proper footwear.</li> </ul>
Noise	<ul style="list-style-type: none"> <li>• The noise levels should be kept as low as possible</li> <li>• The construction or fabrication should be avoided during work hours.</li> <li>• If situations are unavoidable people should be advices to use earmuffs or plugs.</li> </ul>
Smoking	<ul style="list-style-type: none"> <li>• Implementation Section 6A of Smoke-free Environment Act 2000 (NSW).</li> <li>• Regular quit smoking motivation to smokers given by campaigns being held.</li> <li>• The designated smoking areas are marked.</li> </ul>
Communicable diseases	<ul style="list-style-type: none"> <li>• Making people aware of the situation and explaining countermeasures by trained professionals, notices, Pamphlet.</li> </ul>

	<ul style="list-style-type: none"> <li>• Designated medical first aid rooms provide confidential consultation for everyone.</li> </ul>
Fire	<ul style="list-style-type: none"> <li>• Regular fire drills</li> <li>• People are made aware of all the emergency fire alarms, escapes plans and procedures by orientation training and videos when they join.</li> <li>• Smoke alarms and fire fighting equipments are located in strategic locations.</li> </ul>
Ergonomics	<ul style="list-style-type: none"> <li>• Proper working environment</li> <li>• Proper architectural consultation</li> <li>• Pauses and breaks at regular interval</li> </ul>
Bullying and harassment	<ul style="list-style-type: none"> <li>• Having anti bullying and harassment policy</li> <li>• Making people aware of legal obligations like Work Health and Safety Act 2011, Discrimination Act 1991 and what actions will be taken against those who do it.</li> <li>• the Code of Ethics or set of Values makes clear what sorts of behavior is acceptable in the work environment.</li> </ul>
Manual handling	<ul style="list-style-type: none"> <li>• Avoiding manual handling of loads if unavoidable appropriate handling methods should be used.</li> <li>• People working receive adequate knowledge and training by trained people or by the means of notices on how to handle loads of different weights correctly.</li> </ul>
Lighting and air conditioning	<p>Lighting conditions:</p> <ul style="list-style-type: none"> <li>• The lighting conditions of 320 lux is followed according to as/nzs 1680.1:2006 interior and workplace lighting standards</li> </ul> <p>Air conditioning</p> <ul style="list-style-type: none"> <li>• The air conditioning should work at temperature range of 20°c ~ 25°c and relative humidity 50 %.</li> <li>• Regular maintenance should be carried out on the system</li> </ul>
Electrification	<ul style="list-style-type: none"> <li>• Electrical equipments being regularly tested and inspected in accordance with section 150 of the work health and safety regulation 2011 (NSW)</li> <li>• All the electrical appliances and tools should be tagged "safe to use" by a competent person</li> <li>• When a appliance is not in use it should not be plugged in.</li> <li>• Use certified appliances only.</li> </ul>

Table 16 – Risk Reducing Methods

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