

1. Overview (Discharge a tanker load of XXX into XXX)

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1.2 Review details

The task was reviewed by XXX (Plant Manager), XXX (Plant Operator) and Andy Brazier (human factors consultant) on 30th February 2022. It involved:

- Desk-top review of procedure;
- Review of Performance Influencing Factors (PIF) using check-sheet from HSE;
- Completion of human error analysis;
- A walk through of the task and evaluation of local PIF.

This document should be reviewed within five years (maximum) or following any significant modification to associated plant, equipment, procedure and/or task method.

1.3 Task Title and Description

XXX is used to make XXX. It is delivered to site in bulk quantities from tankers..

This task is currently described in the following documents:

- SOP XXX
- COSHH Assessment XXX
- PUWER Assessment XXX
- Single Line Diagram XXX.

1.4 Task Criticality

XXX is a highly flammable liquid and vapour. It is harmful if swallowed, causes severe skin burns and eye damage; and may cause respiratory damage. The task of discharging tanker loads of XXX was selected for task analysis because:

- It involves handling bulk quantities of a flammable material;
- A tanker has to enter the plant area;
- The transfer is by hose;
- Human error could contribute to Major Accident Hazard (MAH) events.

1.5 Major Accident Hazard (MAH) Potential

This task was selected for task and human error analysis because it was identified as having MAH potential.

The Task Analysis (see section 3) has been used to review the MAH scenarios and risk controls.

1.5.1 Adverse chemical reaction

The XXX is transferred from tanker directly to reactors where other reagents are added (reaction is a separate task). If the tanker contained the wrong material there could be an adverse reaction that could create a hazard to people on site and/or the environment.

The main control at the time of the delivery is checking paperwork arriving with the tanker and ensuring it contains XXX. A load would not be accepted without paperwork or if the paperwork did not show the barrel number. Every barrel has a permanently displayed identification number. Also UN number and hazards information. This is cross checked with the paperwork and the tanker would not be unloaded if there was a discrepancy.

Further control is achieved by using only two reputable suppliers.

It is possible that a tanker intended for another part of the site could arrive at the XXX tanker bay. If this was not detected this could result in the wrong material being transferred to the reactors. In practice, other materials delivered to site are chemically compatible and would not cause an adverse reaction. However, the operational and financial implications would be significant.

If an adverse reaction did occur it would be detected by increased temperatures in the reactor. The charge trips automatically at 60°C.

1.5.2 Reactor overflow

Overfilling the reactor could result in a Loss of Containment (LOC) of XXX. The most likely scenario would be a failure to swap receiving reactor half-way through the discharge meaning the full tanker quantity is transferred to one reactor. It would take a considerable time for a LOC because the excess liquid would flow back to the tanker via the vapour line. However, this line is smaller than the reactor inlet so the level would continue to rise until it started to be emitted from the oxidiser, which is open to atmosphere. The oxidiser is connected to the top of the reactors and clean vapours that are evolve.

The quantity discharged to each reactor is determined before connecting the tanker. It is simply a case of halving the total quantity being delivered. A flowmeter with totaliser is used to monitor the quantity received. It includes a safety default that stops the flow when 16,500kg has been discharged. This provides a significant safety margin against overflow.

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It would take a long time for the level in the reactor to reach the oxidiser and the reactor capacity means the maximum quantity released is less than 1 Tonne (i.e. if a full tanker load is discharged to one reactor). As soon as liquid enters the oxidiser it will trigger an alarm and will shutdown the whole system including discharge pump.

XXX is smelly so any release will be detected very quickly.

1.5.3 Hose failure

If the hose carrying the XXX liquid failed it could result in a significant LOC. The tanker bay is bunded, so any liquid spilt will be contained. The chemical plant operator remains in the area (between tanker and reactors) the whole time and can stop the discharge pump at any time if a problem occurs.

One cause of hose failure would be a tanker drive away. The tanker engine is stopped throughout the whole task and the handbrake is applied. The tanker driver will not leave until they are given confirmation that the discharge is complete and the hoses disconnected. They need to have paperwork to leave, which will not be provided until it is safe to leave.

Plans are in place (for completion XXX) to fit driveaway couplings that would prevent a hose rupture and automatically close the discharge if the tanker did driveway.

It is recognised that other sites across the industry apply additional controls for the risks of tanker drive away. An action has been raised for XXX to review arrangements and confirm that the risks are As Low As Reasonably Practicable (ALARP).

1.5.4 Coupling release during discharge

Similar to hose failure, if the coupling parted during discharge it could result in a significant LOC.

Dry break couplings are used that default to a closed position and will not open until properly engaged. The coupling has two sealing faces, so a disconnect would create a very small release of liquid.

Dry break couplings are considered as industry good practice. Spares are kept on site so no load will be discharged without one.

1.5.5 Ignition due to static

Liquids flowing through hoses can create static. A discharge can cause ignition leading to a fire.

An earth connection is provided at the tanker discharge area and used each time. Hoses are conducting so static is unlikely. It is a standard requirement to attach the earth for every tanker operation on site (and the wider industry) and a dedicated connection is immediately available. There is no vapour/air mixture created during discharge.

1.5.6 LOC when disconnecting the hose from the tanker

There is the potential for a significant release of if errors are made when disconnecting (valves left open and if there is still a quantity of XXX in the tanker. This could occur if the discharge is stopped partway through because the operator believes incorrectly that the tanker is empty.

Tanker has two liquid valves that will be closed before disconnecting the hose. If XXX was released whilst disconnecting the driver will be immediately aware and can take action to prevent the LOC. The Respiratory Protective Equipment (RPE) may provide some protection against immediate vapour exposure.

1.6 ALARP Well-Reasoned Argument

Guidance from IMechE ALARP for Engineers (2021) proposes a proforma for making a Well-Reasoned Argument that risks are As Low As Reasonably Practicable (ALARP). The table below uses this to summarise current arrangements for the task.

	Assessment of current arrangements
Identification	
System definition	This assessment applies to the XXX tanker discharge and reactors at the XXX site.
Context (operations, conditions, environment etc.)	The assessment applies to the normal method used to discharge XXX from one of the two approved suppliers who use tankers. The liquid and vapour hoses are secured at the site end. Adaptors are fitted to the tanker connections to receive the hose couplings, which includes a dry break coupling for the liquid.
Hazards	The MAH is XXX. This is an essential component for manufacture of XXX. The 40% grade is less hazardous than 50% but has a significant impact on production. The proposed 45% grade is considered to provide an optimum balance between hazard and productivity.
Failure modes and causes	The assessment has systematically considered human errors that can occur during the task. The performance influencing factors evaluation has considered how the likelihood of error may be affected.
High level safety objective	The high-level objective is to transfer XXX from a tanker into the two reactors without LOC.
Assessment	

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Reasonably foreseeable consequence	The worst reasonably foreseeable consequence is a release of XXX that could result in fire, harm to people and the environmental releases.
Relevant good practice, standards, approved codes of practice, guidance	The plant including hose, coupling tanks, pipework and valves were designed and built to the engineering standards applicable at the time.
Assumptions and uncertainties	Assumptions made in this assessment are documented in the Preconditions (see Section 3 below).
Detailed safety objectives	Safety is achieved by receiving XXX from two reputable suppliers that have good systems in place and a good track record of supplying the correct materials with the required paperwork. Suitable hoses and couplings are used to connect to the tanker. Plant pipework is rigid and all items including the pump are made of materials suitable for XXX. Active engineered controls are in place to minimise the risk of overfilling the reactors. Discharge can be stopped immediately there is any problem by stopping the pump.
Option rejection and reasons (e.g. gross disproportion, inapplicability)	Hoses can be considered a weak point and rigid offloading arms may be considered a more robust option. However, hoses are industry standard and considered to be safe and reliable for this use. Additional active engineered controls (alarms, trips) could be added to the system but the current arrangements are considered to be effective and additions would not reduce the overall risk significantly.
Risk reduction Measures	
Hardware control measures	The plant is designed for XXX service and satisfies existing safety requirements.
Software controls (competence, procedural, management systems)	Personnel may carry out this task reasonably frequently. A procedure defines the full task method and a simplified version is included in the offloading sheet that is used for every delivery.
Lifecycle criteria (where applicable)	No additional lifecycle considerations have been identified for this task.

Based on the above assessment it is concluded that risks will be ALARP once the actions (see section 2 below) have been implemented..

2. Recommended actions

The table below summarises recommended actions for improvement extracted from the task and error and analysis (see section 3) and PIF report (see section 4).

No.	Reference (task step or PIF code)	Action description	Action owner
1	Step 2.2	Review the controls to prevent tanker driveaway. Consider whether industry good practice is being achieved so that the risks are ALARP.	Safety
2	Step 2.4	Contact the haulier to determine how air operated valves on XXX tankers are operated and what would happen if the barrel is left over night for discharge without the driver present.	Operations
3	Step 6.1 PIF J2 Interfaces	Provide a mirror display of oxidiser temperature so that it is visible when upstairs near the reactors.	Engineering
4	Step 6.2 PIF J2 Interfaces	Consider providing a white board or similar adjacent to the upstairs meter so that the changeover quantity can be recorded. This will replace the bit of card currently used by operators.	Operations
5	Step 8.1	Review potential implications of paperwork being in a foreign language. Currently XXX operators are being asked to sign something that they do not understand. The haulier may be able to provide an English version.	Operations
6	PIF J1 – Signs	Consider erecting a sign above the tanker bay identifying it as the XXX and YYY offloading area. This sign should be visible from the plant road so that tanker drivers can be sure they are parking in the right place.	Operations
7	PIF J5 - Procedures	Update procedure to reflect this task analysis.	Operations
8	P5 – Competence	Ensure the training and assessment system for XXX operators covers the items listed below.	Operations
9	PIF O7 – Use of procedures	Update the SOP and offloading sheet to specify when the documents shall be used (i.e. SOP for training and assessing competence and offloading sheet for every XXX delivery)	Operations

XXX Operator competence requirements include

- Able to discharge tankers safely
- Know the hazards of XXX and risk controls
- Know reactor fill levels and requirement to change routing half way through discharge

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- Know how tanker is to be secured in position when discharging (engine off, brake on)
- Able to operate dry break couplings

Understand requirement for earth connection

3. Task and Human Error Analysis

Preconditions
<ul style="list-style-type: none"> * Required PPE is available * Driver has the delivery paperwork * Oxidiser is operational and solid green light is on * Chemicals Plant Operator is available for the discharge * Batch sheet has been issued and started

ID	Description	Comments	Failure Mode	Consequences	Risk controls	PIF	Actions
Plan 0	Do in Sequence						
1	Complete pre-discharge checks						
1.1	Confirm the barrel number shown on the tanker's paperwork matches the number shown on the barrel		Check omitted - barrel number does not match	MAH - Potential adverse reaction when other reagents are added to the reactor.	Load would not be accepted without paperwork or if the paperwork did not show the barrel number. Every barrel has a permanently displayed ID number.	J1 – Signage on plant and tanker J6 – Preparation (paperwork) P5 – Competence (tankers and XXX hazards)	

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ID	Description	Comments	Failure Mode	Consequences	Risk controls	PIF	Actions
1.2	Check paperwork and confirm product is XXX40, 45 or 50		Check omitted - product is not XXX	MAH - Potential adverse reaction when other reagents are added to the reactor.	Two reputable suppliers used. Other materials delivered to site would not cause an adverse reaction. Adverse reactions would be detected by increased temperatures in the reactor and charge trips automatically at 60C. Suitably sized bursting discs on reactors routed to dump tank. Independent second check by supervisor before accepting the load.	J1 – Signage on plant and tanker J6 – Preparation (paperwork) P5 – Competence (tankers and XXX hazards) O8 – Organisation learning (reputable suppliers)	
1.3	Confirm the UN number shown on the tanker is 666		Check omitted - UN number is not correct	MAH - Potential adverse reaction when other reagents are added to the reactor.	Load would not be accepted without paperwork or if the paperwork did not show the UN number. Every barrel has a UN number when on the road.	J1 – Signage on plant and tanker J6 – Preparation (paperwork) P5 – Competence (tankers and XXX hazards) O8 – Organisation learning (reputable suppliers)	
1.4	Record the temperature of the product	Use gauge on side of barrel. If > 25C permission to discharge is required from Plant manager	Information not recorded	No significant consequence.			

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ID	Description	Comments	Failure Mode	Consequences	Risk controls	PIF	Actions
1.5	If XXX50 is being delivered, if temperature > 25C obtain permission from Plant Manager before proceeding		Plan omitted - allowances for high temperature product not made when discharging	If reagents are not added more slowly to account for the high temperature XXX a high temperature would occur in the oxidiser. High temperature may result in damage to oxidiser catalyst and increased environmental emissions.	High temperature alarm and trip on oxidiser.		
1.6	Record the quantity of XXX on the tanker		Information not recorded	MAH - May not know when to changeover the reactors. May contribute to an overflow. Liquid will start to return to the tanker via the vapour line. Over time the level in the reactor will continue to rise and it will start to be emitted from the oxidiser.	Flowmeter automatically stops the pump when 16,500 KG has been transferred. It would take a long time for the level to reach the oxidiser and the reactor capacity means the maximum quantity released is < 1 Te. Liquid in the oxidiser will cause an alarm and it will shutdown. XXX is smelly so any release will be detected very quickly.	J2 – Interfaces J9 – Communication (record quantity to switch for colleagues) P5 – Competence (reactor levels)	

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ID	Description	Comments	Failure Mode	Consequences	Risk controls	PIF	Actions
1.7	Confirm combined space in both reactors is sufficient to receive the full load	Discharge will be split between 2 reactors but both should have sufficient capacity to receive the full load	Check omitted or incorrect - there is not enough space in the 2 reactors to accommodate the load	MAH - May not know when to changeover the reactors. May contribute to an overflow. Liquid will start to return to the tanker via the vapour line. Over time the level in the reactor will continue to rise and it will start to be emitted from the oxidiser.	Flowmeter automatically stops the pump when 16,500 KG has been transferred. It would take a long time for the level to reach the oxidiser and the reactor capacity means the maximum quantity released is < 1 Te. Liquid in the oxidiser will cause an alarm and it will shutdown. XXX is smelly so any release will be detected very quickly.	J6 – Confirming sufficient space before starting discharge P5 – Competence (reactor levels)	
1.8	Confirm both reactors have Stage 1 in and record the quantity	XXX40 = 6Te Stage 1 XXX50 = 5Te Stage	Check omitted - Stage 1 has not been added	Completing the reaction will take longer. No safety or environmental consequences.			

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ID	Description	Comments	Failure Mode	Consequences	Risk controls	PIF	Actions
1.9	Record the first vessel to receive the XXX	Preference is R4 due to slightly less impact on the emissions system	Information not recorded	MAH - May contribute to reactor overflow if there is confusion about which reactor has already been loaded.	Reactor loaded is also recorded on the batch sheet. Offloading sheet records when the reactors are changeover. It would take a long time for the level to reach the oxidiser and the reactor capacity means the maximum quantity released is < 1 Te. Liquid in the oxidiser will cause an alarm and it will shutdown. XXX is smelly so any release will be detected very quickly.	J5 – Procedures (information recorded on offloading sheet)	
2	Position tanker						
2.1	Reverse tanker into offloading bay		Action misaligned - impact when reversing	Damage to the tanker or plant	There is nothing vulnerable in the tanker bay. There are substantial concrete walls.		
2.2	Stop engine		Action omitted - engine left running	MAH - No immediate consequence from the engine but may contribute to drive away.	Driveaway coupling (to be fitted). Driver will not leave until given confirmation by the operator and signed off paperwork.	P5 – Competence (tanker controls)	Review the controls to prevent tanker driveaway. Consider whether industry good practice is being achieved so that the risks are ALARP.
2.3	Apply handbrake		Action omitted - handbrake not applied	Tanker may roll back.	There is nothing vulnerable that could be affected if the tanker did roll.		

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ID	Description	Comments	Failure Mode	Consequences	Risk controls	PIF	Actions
2.4	Connect air supply if required		Action omitted - air supply not connected	May not be able to open vapour valve			Contact the haulier to determine how air operated valves on XXX tankers are operated and what would happen if the barrel is left over night for discharge without the driver present.
3	Connect tanker						
3.1	Connect coupling adaptor to the tanker vapour return connection		Action omitted - adaptor not connected	Cannot connect the hose			
3.2	Connect vapour return hose to the tanker using camlock coupling		Action omitted - vapour hose not connected	Vapour releases during discharge. Will cause significant odour nuisance.	Release will be outside. Likelihood of serious harm to people or forming a flammable atmosphere considered to be very low.		
3.3	Attach male dry-break adaptor to the tanker liquid outlet		Action omitted - adaptor not connected	Will not be able to connect the hose			

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ID	Description	Comments	Failure Mode	Consequences	Risk controls	PIF	Actions
3.4	Connect liquid hose to the dry-break coupling		Action incomplete - hose not connected properly	MAH - Release of liquid from the tanker	Dry break coupling will not open until properly engaged. Coupling has two sealing faces, so a disconnect would be a very small release of liquid. Dry break couplings are considered as industry good practice. Spares are kept on site so no load will be discharged without one.	J8 – Tools and equipment (dry break coupling) P5 – Competence (dry break coupling)	
3.5	Connect earth to the tanker		Action omitted - earth not connected	MAH - Potential static discharge causing ignition.	Hoses are conducting. Standard requirement to attach the earth and a dedicated connection is immediately available. There is no vapour/air mixture created during discharge.	J8 - Tools and equipment (earth connection) P5 – Competence (earthing)	
3.6	Reset the downstairs flow meter		Action omitted - flow meter not reset	Discharge will trip when it reaches 16,500 KG (well before half load).	There is no physical overfill scenario from failing to reset.		
4	Line-up plant for discharge						

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ID	Description	Comments	Failure Mode	Consequences	Risk controls	PIF	Actions
4.1	Obtain castell key for the 1st reactor to be filled		Action omitted - key not obtained	Will not be able to open the reactor inlet. Will not be able to offload the tanker	Interlock prevents stops all pumps if both keys are removed from the key box at the same time.		
4.2	Open reactor vapour return valve	R4 = 08 R3 = 07	Action omitted - valve left closed	May result high rates of vapour to the oxidiser, and may cause higher temperatures that require the discharge to stop. Will cause a vacuum on the tanker barrel, which will slow down the rate of discharge.			
4.3	Align the vapour routing valve for the reactor	R4 = Open 09 R3 = Close 09	Action misaligned - valve in wrong status	May result high rates of vapour to the oxidiser, and may cause higher temperatures that require the discharge to stop. Will cause a vacuum on the tanker barrel, which will slow down the rate of discharge.			
4.4	Insert Castell key and open the reactor inlet valve	R4 = 04 R3 = 03	Action omitted - valve left closed	Will dead head the pump. May damage the pump.	Pump is protected against high temperature.		
4.5	Align the liquid routing valve for the reactor	R4 = Open 05 R3 = Close 05	Action misaligned - valve in wrong status	Will dead head the pump. May damage the pump.	Pump is protected against high temperature. Pump discharge pressure is not enough to cause pipework to fail.		

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ID	Description	Comments	Failure Mode	Consequences	Risk controls	PIF	Actions
4.6	Reset the upstairs flowmeter		Action omitted - valve not reset	No significant consequence. Flowmeter is for information only.	Control is via the downstairs meter only.		
5	Start to discharge contents of tanker						
5.1	Open tanker vapour valve		Action omitted - valve left closed	May result high rates of vapour to the oxidiser, and may cause higher temperatures that require the discharge to stop. Will cause a vacuum on the tanker barrel, which will slow down the rate of discharge.			
5.2	Open tanker liquid valve		Action omitted - valve left closed	Pump will run dry. May be damaged.	Pump is protected against running dry.		
5.3	Open pump inlet valve	01	Action omitted - valve left closed	Pump will run dry. May be damaged.			
5.4	Open pump outlet valve	02	Action omitted - valve left closed	Pump will run dead headed. May be damaged.	Pump is protected against high temperature. Pump discharge pressure is not enough to cause pipework to fail.		
5.5	Visually check for leaks	If there are leaks close the pump and tanker valves and investigate	Check omitted - leak not detected	There may be a drip from coupling adaptor on the tanker or plant side gasket, which causes odour issues.			

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ID	Description	Comments	Failure Mode	Consequences	Risk controls	PIF	Actions
5.6	Confirm flowmeter is showing zero		Check omitted - meter showing more than zero	Discharge will trip when it reaches 16,500 KG (well before half load).			
5.7	Start pump		Action omitted - pump not started	Delay in discharging the tanker			
5.8	Visually check for leaks		Check omitted - leak not detected	There may be a drip from coupling adaptor on the tanker or plant side gasket, which causes odour issues.			
6	During the discharge						
6.1	Continuously monitor oxidiser is online at < 400C	If green light goes off, stop the discharge	Monitoring omitted - discharge continues with oxidiser offline	Will be in breach of IPPC permit. May result in odour complaints.	Oxidiser status and temperature are displayed and visible in the plant area. High temperature alarm at 475C and high high alarm and trip at 550.		Provide a mirror display of oxidiser temperature so that it is visible when upstairs near the reactors.

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ID	Description	Comments	Failure Mode	Consequences	Risk controls	PIF	Actions
6.2	Monitor the flowmeter continuously	Operator must be present at the pump 1Te before the split and 1Te before full load	Monitoring omitted	MAH - May miss the changeover point. May contribute to overfill	Flowmeter automatically stops the pump when 16,500 KG has been transferred. It would take a long time for the level to reach the oxidiser and the reactor capacity means the maximum quantity released is < 1 Te. Liquid in the oxidiser will cause an alarm and it will shutdown. XXX is smelly so any release will be detected very quickly.	J2 – Interfaces P5 – Competence (reactor levels)	Consider providing a white board or similar adjacent to the upstairs meter so that the changeover quantity can be recorded. This will replace the bit of card currently used by operators.
6.3	When half the tanker content has been discharged, changeover reactors		Action too early or too late	MAH - May contribute to tanker overfill if the timing is significantly wrong.	Flowmeter automatically stops the pump when 16,500 KG has been transferred. It would take a long time for the level to reach the oxidiser and the reactor capacity means the maximum quantity released is < 1 Te. Liquid in the oxidiser will cause an alarm and it will shutdown. XXX is smelly so any release will be detected very quickly.	J2 – Interfaces P5 – Competence (reactor levels)	

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ID	Description	Comments	Failure Mode	Consequences	Risk controls	PIF	Actions
6.3.1	Stop pump		Action omitted - pump left running	Pump will be deadheaded and may be damaged.			
6.3.2	Close reactor vapour return valve		Action omitted - valve left open	No significant consequence			
6.3.3	Change the vapour routing valve		Action omitted - valve not switched	May not have a vapour return route (see above)			
6.3.4	Close reactor valve and remove Castell key		Action omitted - key not removed	Will not be able to run the pump if both keys are removed from the key box			
6.3.5	Change the liquid routing valve		Action omitted - valve not changed	May deadhead pump			
6.3.6	Exchange the Castell keys		Action omitted - keys not exchanged	Cannot open inlet to the second reactor			
6.3.7	Open reactor vapour valve		Action omitted - valve left closed	May result high rates of vapour to the oxidiser, and may cause higher temperatures that require the discharge to stop. Will cause a vacuum on the tanker barrel, which will slow down the rate of discharge.			
6.3.8	Insert Castell key and open the reactor inlet valve		Action omitted - valve left closed	Will dead head the pump. May damage the pump.			
6.3.9	Reset upstairs flow meter		Action omitted - meter not reset	Minor inconvenience. Will have to repeat the calculation.	Tanker will empty without any further intervention.		

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ID	Description	Comments	Failure Mode	Consequences	Risk controls	PIF	Actions
6.3.10	Reset downstairs flow meter		Action omitted - meter not reset	Pump will stop at 16,500 KG. Will delay discharge to reset. May make it more difficult to calculate the quantity of para formaldehyde that will be added.			
6.3.11	Start pump		Action omitted - pump not started	Delay completing the discharge.			
6.4	When the flow stops, stop the pump		Action omitted - pump left running after tanker is empty	Pump runs dry and may be damaged	As above		
			Action too early - stop discharge too early	MAH - Potential significant release if errors are made when disconnecting (valves left open) if there is still a quantity of XXX in the tanker.	Tanker has two liquid valves. Driver will be immediately aware when disconnecting. RPE may provide some protection against immediate vapour exposure.	J2 – Interfaces (flowmeter totaliser) J6 – Preparation (tanker paperwork shows quantity)	
6.5	Close pump outlet valve		Action omitted - valve left open	Leaving the pump valves open may allow XXX to run back through the pump. Quantity limited to < 10 litres	Dry break coupling will be closed so run back will not result in a release of XXX		
6.6	Close pump inlet valve		Action omitted - valve left open	Leaving the pump valves open may allow XXX to run back through the pump. Quantity limited to < 10 litres	Dry break coupling will be closed so run back will not result in a release of XXX		
7	Disconnect tanker						

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ID	Description	Comments	Failure Mode	Consequences	Risk controls	PIF	Actions
7.1	Don RPE for disconnection		Action omitted - RPE not donned	Approx 30ml of XXX is released when the coupling is released. Without RPE and driver and/or operator will suffer discomfort from the vapour produced.			
7.2	Close tanker vapour valve		Action omitted - valve left open	No significant consequence because tanker is empty at this stage.			
7.3	Disconnect vapour hose		Action omitted - hose left connected	Damage to hose, tanker or plant when tanker drives away.			
7.4	Close tanker liquid valve		Action omitted - valve left open	No significant consequence because tanker is empty at this stage.			
7.5	Disconnect liquid hose		Action omitted - hose left connected	Damage to hose, tanker or plant when tanker drives away.			
7.6	Remove hose coupling adaptors		Action omitted - adaptors left connected	Financial implications of lost adaptors			
8	Allow tanker to leave						
8.1	Sign-off delivery paperwork		Action omitted - paperwork not signed	No significant consequence			Review potential implications of paperwork being in a foreign language. Currently XXX operators are being asked to sign something that they do not understand. The haulier may be able to provide an English version.

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ID	Description	Comments	Failure Mode	Consequences	Risk controls	PIF	Actions
8.2	Send tanker to weighbridge		Communication omitted - tanker leaves without going to weighbridge	May not be able to reconcile the quantity received.	Supplier has already weighed the contents.		
9	Shut reactor valves						
9.1	Shut reactor inlet valve and remove Castell key	03	Action omitted - valve left open	No significant consequence. May cause confusion for next delivery			
9.2	Ensure liquid routing valve is closed	07	Action omitted - valve left open	No significant consequence. May cause confusion for next delivery			
9.3	Shut reactor vapour valve	04	Action omitted - valve left open	No significant consequence. May cause confusion for next delivery			
9.4	Ensure vapour routing valve is closed	05	Action omitted - valve left open	No significant consequence. May cause confusion for next delivery			
9.5	Return the Castell key		Action omitted - key not returned	May not be able to complete a subsequent discharge.	Spare keys are available but are secured and will only be used with formal authorisation from manager level.		

4. Performance Influencing Factors (PIF)

4.1 PIF Report

This PIF report has been completed following a task walk-through. The task analysis (Section 2) was used to identify potentially relevant PIFs. The walk-through was used to evaluate the quality of these PIFs and their potential to influence human performance.

No.	PIF	Key points	Assessment	Action
	Job factors			
J1	Clarity of signs, signals, instructions and other information	Valve identification	Valve labelling is variable. There is a good sign at the offloading point. There is no area identifying sign (i.e. XXX and YYY offloading area).	Consider erecting a sign above the tanker bay identifying it as the XXX and YYY offloading area. This sign should be visible from the plant road so that tanker drivers can be sure they are parking in the right place.
		Tanker labelling	Show UN number and hazards. Industry standard. No issues identified	No action
J2	System/equipment interface (labelling, alarms)	Flowmeter Oxidiser status and temperature	Oxidiser temperature is only visible from the lower level.	Action above to provide a repeater of the oxidiser temperature display at the upper level
		Reminder of when to split the discharge.	Currently using scrap card for handwritten notice	Action above to provide a whiteboard for the split reminder.
J3	Difficulty/complexity of task	Fairly standard task	Simple but viewed as hazardous with dedicated pipework. No issues identified	No action
J4	Routine or unusual	Minimum 3 deliveries per week.	No issues identified.	No action

Task Analysis Report – Discharge a tanker load of XXX into XXX

No.	PIF	Key points	Assessment	Action
J5	Procedures inadequate or inappropriate	Full SOP + Offloading sheet. Tanker documentation and batch sheet. Supporting docs include COSHH, PUWER, single line diagram, risk assessment	Offloading sheet provides spaces to record critical information before, during and after discharge. No issues identified.	Update procedure to reflect this task analysis.
J6	Preparation for task (e.g. permits, risk assessments, checking)	Delivery is expected. Paperwork arrives with the tanker showing product name/grade and UN number. Also quantity.	Quantity in tanker used to confirm sufficient space in the reactors and to calculate when to switch, No issues identified	No action
J7	Time available/required - Divided attention	2 to 2.5 hours	Operator is able to monitor closely throughout. Has to be aware of other activities, but only in the immediate area.	No action
J8	Tools appropriate for task	Hose and coupling	Hose is suitable for XXX. Dry break coupling considered to be industry good practice. No issues identified.	No action
		Earth connection	Dedicated for the task. No issue identified	No action
		Driver uses hand tools for coupling adaptors.	Couplings require no tools to make/break. No issues identified	No action
J9	Communication, with colleagues, supervision, contractor, other	Operator to driver (at start and end) – direct verbal Handover between operators going on a break. Plant Manager to Shift Manager, to inform them a delivery is due, product to make etc.	Quantity of discharge when the reactors have to be switched is calculated at the start and written down. This will be communicated to colleagues if there is a handover. No issues identified	No action
J10	Working environment (noise, heat, space, lighting, ventilation)	Tanker and connection point is outside. Lighting is good. Most deliveries during day. Plant is inside a building	No issues identified	No action

Task Analysis Report – Discharge a tanker load of XXX into XXX

No.	PIF	Key points	Assessment	Action
J11	Access to worksite or equipment (including use of tools)	Access to valves at tanker discharge point and around the reactors.	Pump inlet valve is low down and generally operated by foot. Vapour and liquid routing valves are high and a portable step is provided for access. No issues identified.	No action
	Person factors			
P1	Physical capability and condition	Hose and coupling requires physical strength. Driver will help the operator if required.	Hose is usually relatively empty of liquid so not too heavy. No issues identified	No action
P2	Fatigue (acute from temporary situation, or chronic)	Not usually an issue.	May performed in early hours of morning, but this is infrequent. Operators work shifts so this is just another task to be performed on the night shift. No issues identified.	No action
P3	Stress/morale	Not stressful	No specific time pressure. No issues identified	No action
P4	Work overload/underload	Not considered particularly relevant to this task	No issues identified	No action

Task Analysis Report – Discharge a tanker load of XXX into XXX

No.	PIF	Key points	Assessment	Action
P5	Competence to deal with circumstances	The task is specifically covered in the competence assurance system (chemical distribution). Competence crane driver re quired	Competence requirements include <ul style="list-style-type: none"> • Able to discharge tankers safely • Know the hazards of XXX and risk controls • Know reactor fill levels and requirement to change routing half way through discharge • Know how tanker is to be secured in position when discharging (engine off, brake on) • Able to operate dry break couplings • Understand requirement for earth connection 	No action
P6	Motivation vs. other priorities	This task is prioritised over all other production tasks. If there is a staffing issue other activities will be stopped to allow this to happen.	No issues identified	No action
	Organisation factors			
O1	Work pressures e.g. production vs. safety	No time pressure imposed	No issues identified	No action
O2	Level and nature of supervision / leadership	Shift Manager or an experienced operator is always in the area to supervise/assist.	No issues identified	No action
O3	Communication	XXX in constant communication with hauliers.	No issues identified	No action
O4	Manning levels	One operator for the task	No issues identified	No action
O5	Clarity of roles and responsibilities	Operations vs driver	No issues identified	No action

Task Analysis Report – Discharge a tanker load of XXX into XXX

No.	PIF	Key points	Assessment	Action
O6	Peer pressure	Not considered particularly relevant to this task	No issues identified	No action
O7	Consequences of failure to follow rules/procedures	Offloading sheet is printed and completed every time the task is done. Completed copies are scanned and stored electronically.	The SOP refers to the offloading sheet does not mandate its use	Update the SOP and offloading sheet to specify when the documents shall be used (i.e. SOP for training and assessing competence and offloading sheet for every XXX delivery)
O8	Organisational learning (learning from experiences)	Reputable suppliers used.	XXX only received from two suppliers. No issues identified	No action
O9	Organisational or safety culture, e.g. everyone breaks the rules	Not considered particularly relevant to this task	No issues identified	No action

4.2 Photos

The following photos are record of observations made during the task walk-through