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Risk Assessment of Chemicals Transportation by Road in Egypt

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Abstract

This study aimed to, estimate the hazard involved during chemicals transportation using truck trailer from Alexandria to idku site .

This study was carried-out on 40 drivers that drive their petroleum tank from Alexandria To Idku for determination of the risk hazards that may exposed to it during transportation of the petroleum oil from Alexandria to Idku in the time frame 2019-2020.

This risk assessment method will utilize a matrix system that will evaluate the interaction between the main factors.

The results concluded that, transportation of petroleum products by road truck creates numerous opportunities for hazardous materials to be accidentally released into the environment, the most activities of a highest risk includes driving on the roads, Loading and checking/securing the lashing/ valves after finish loading, driving to the clients, driving into the site, Stopping & shutting the truck down. The results on the existing control measures cleared that, the highest existing control measures observed in Training the driver to defensive diving, wearing a proper gloves &watch out what to touch, Pre mobilization safety check of the truck, It is environmental issue because the theft don't know what hazmat he dealing with, Never drive without lights, Pre-operating Check, if anything you found wrong inform your supervisor and go to maintenance to repair. obey follow-up of preventive maintenance. The higher risk incidences observed in the long distances of the transportation. Also, Urine and blood analysis must be carried-out on the drivers continuously for detection of the level of anathetics drugs to avoid any accidents or risks results from this drugs.

Key words: Risk Assessment, Chemicals Transportation, Road, Egypt

Introduction

Increase in population has contributed to the increase in demand for petrol consumption on the improvement of social welfare specifically in transportation. Malaysia has consumed 28.699 tons of petroleum-based energy in 2015 and a cumulative of 281799 tons of petroleum-based energy from 2005 to 2015 (Energy Commission, 2018).

According to yearly report of Egypt transport around 19.2 million ton of petroleum products by trucks in 2019-2020 (central agency for public mobilization andstatics, 2020)

A steady increase from 14 million to 19 million active vehicles on the road in Malaysia was recorded by the Malaysian Road and Transport Department from 2008 until 2015 (MRTD, 2015). Intensive usage of vehicle fuel would mean the distribution of petrol stations across communities keep increasing. Currently, there are 1470 petrol stations in Malaysia..

Issue related to safety, health and environmental has become major priority to be concerned of in the transportation of hazardous materials (HAZMAT) worldwide. Due to the high risk that entailed in the operation of Hazard materials (HAZMAT) transportation, many accidents in this industry have been reported which include chemicals spillage, fire and explosion. In order to quantify the degree of hazards and risks of these accidents, various assessment methods have been introduced either by the academia, the industry as well as the authority. The methods present various approaches for the assessment, ranging from a simple to highly complicated ones depending on the purpose of the assessment and the available resources and constraints. (Yacob and Hassim, 2017).

Transportation of petrol is control by the petrol companies, where each company had assigned specific vendors (known as tanker company) to transport the product to their own petrol stations. Petrol station is required to inform the refinery depot that their product need to be refilled and the order will be sent out to the tanker company. Tanker company will send out their petrol tanker driver to the refinery depot to collect the product based on the order and drive out the product from the depot to the respective petrol station where the tanker driver is required to transfer the product into the petrol stations storage tank. Petrol tanker driver must then report back to the refinery depot to verify that the transfer had been made safely and lastly report back to the tanker company to complete the process. Petrol tanker drivers are required to handle the petrol product in bulk amount and susceptible to high risk of exposure especially during loading and unloading of petrol into the petrol station where each session took about 1–2 h depending on the amount (Syimir et al., 2018b).

Understanding the hazard awareness level of tanker driver is vital to ensure that they are equipped with the proper knowledge and understanding regarding the risk of their occupation (Bendickson et al., 2018; Niaz et al., 2015).

Studies showed that level of awareness of tanker driver had a significant correlation with the employee's reaction to hazard while working (Rogério dos Santos Alves and Alex Soares de Souza, 2014; Zainal Abidin et al., 2018).

Occupational Safety and Health Administration (OSHA) regulations enforced the employer to provide training to prepare the tanker driver with sufficient input regarding their working hazard (Rogério dos Santos Alves and Alex Soares de Souza, 2014).

Handling petrol proves to have significant risk on tanker driver health in short and long run making it important to identify the awareness level of the tanker driver (Mitri et al., 2015; Neghab et al., 2015).

The transportation of chemicals is necessary for the manufacturing and distribution of products within and across regional and international borders. Many of these shipments are regulated for transportation and are typically referred to as “dangerous goods” or “hazardous materials.” These daily shipments via land, sea, and air are critical to economies across the globe, but these activities may also pose a potential risk to public safety and the environment if an accidental or intentional release were to occur during transit. (Ambisisi et al., 2015).

Transportation of petroleum products by road truck creates numerous opportunities for hazardous materials to be accidentally released into the environment. chemical properties, sensitivity of host environment and proximity of human presence such releases have safety and environmental consequences. (Nijolė N,2018)

Risk assessment of transportation of hazardous materials has attracted research attention during the last 20 years. Within the research conducted on transportation of hazmat on roads three approaches can be distinguished. The first approach is the development of frameworks for improving emergency responses based on road, weather, and traffic factors. The second is based on conducting survey and accident risk analysis from historic data to divulge accident characteristics such as frequency of occurrence, accident consequences, and identification of causal factors. The last

approach focuses on the development of decision-making frameworks aimed at improving choice of truck capacity and route. (Nijolė N,2018).

Tanker driver may be unable to identify the spillage due to the impairment of the sense such as smell due to constant contact with petrol (Menzel et al., 2019).

Statement of the Problem

This study aimed to, estimate the hazard involved during chemicals transportation using truck trailer from Alexandria to idku site:

Plan And Method Study

This study carried-out to Estimate the hazard involved during chemicals transportation using truck trailer from Alexandria to idku site.

This study was carried-out on 40 drivers that drive their petroleum Tank from Alexandria To Idku for determination of the risk hazards that may exposed to it during transportation of the petroleum oil from Alexandria to Idku in the time frame 2019-2020.

This risk assessment method will utilize a matrix system that will evaluate the interaction between the main factors.

This work will be by breakdowns the transportation processes into steps and then every step will have risk assessment **(Roberto B,2004)** by: -

Identify the Hazard (BS ISO31000,2018), Decide who might be harmed and how, Evaluate& analyze the Risk (severity & likelihood), Add the Controls of the Risk according to hierarchy method, Review the Risk Assessment after controls, Implementation of Risk Assessment

And below are some factors:- Drivers (CEFIC,2013), Skills, Experience, Training, Fitness (law 12,2003), Equipment and content (United Nations,2019), Tank safety requirements, Chemicals classification, Truck safety requirements, Trailer safety requirements, Maintenance record, Emergency equipment's, Road (Andrea C,2016), Road quality, Weight support , Traffics, Population density, Weather conditions, Emergency (U.S Department of Transportation,2012), Types of emergency (Law 4,1994), In case of fire, In case of spillage and Waste management

Risk assessment calculations:

Risk Assessment Rating Equation **(Li-ping L,2011),** Severity (Ci): - A measure of the adverse effects of an event range from 1-5, Frequency (Likelihood) (Pi): - A measure of the expected probability or frequency of occurrence of an event range from 1-5

$$\mathbf{TR(r)} = \sum_{i=1}^{n} (PiCi)$$

Table (1): Risk category and its required response.

key	Risk/Category Inspection priority	Required response
1to4	Minor	Some risk controls may still be justified Manage the process by routine job Identify hazards and implement the control as required
5to9	Moderate	Further Risk Reduction Measures should be considered to ensure risk is ALARP Complete risk assessment; Identify hazards and implement the control to reduce risks; Management responsibility must be defined.
10to16	High	Must implement extensive controls to ALARP; Immediate action is required, activity must not start or if started must be stopped; Identify and implement controls to reduce risk to low before starting or recommencing activity; Senior site management needs to be involved
20to25	Extremely High	Cannot accept this risk / Redesign; Highest level corporate management needs to be involved.

Table (2): Matrix Table (API 581,2008)

RISK LEVEL		Likelihood				
		(5) Almost Certain	(4) likely	(3) Possible	(2) Unlikely	(1) Rare
Severity	(5) catastrophic	25	20	15	10	5
	(4) Major	20	16	12	8	4
	(3) Minor	15	12	9	6	3
	(2) Simple	10	8	6	4	2
	(1) Negligible	5	4	3	2	1

Table (3): Status of risk among different severity level.

Severity (S)	**Level**	**Status**
Catastrophic	5	.Could result in one or more of the following : death, permanent total disability irreversible significant environmental impact , or monetary loss equal to or exceeding 100,000 LE
Major	4	Major injury or occupational disease requiring sick leave more than 21 days and / or monetary loss between 10,000 & 50,000 LE
Minor	3	A minor injury or occupational disease that requires sick leave from 10 days to 21 days and / or monetary loss less than 10,000 LE
Simple	2	A minor injury or occupational disease requiring a sick leave of less than 10 days or damage that is repaired without costs
Negligible	1	Injuries are treated with First Aid on the same day and the injured person returns to work immediately. No damage

Table (4): Status of risk among likelihood level

Likelihood (L)	Level	Status
Almost Certain	5	Almost inevitable that an incident would occur; impacting factors outside control of organization
likely	4	Accident, occupational disease or damage occurs once work is done in this activity
Possible	3	The probability of injury, occupational disease or may occur two or more times during the year
Unlikely	1	The risk of injury, occupational disease or damage may occur once a year
Rare	1	No single injury , illness or damage during the year

Table (5): Code of risks and its required action

Code	Risk Priority Level	Required Action
15 >	Very High Risk	• Operation not permissible; immediate action requires
10-14	High Risk	• Immediate action is required before operation can begin • Immediately report risk exposure at this level to management
6-9	Medium Risk	• Take action as soon as possible to prevent harm • Report risks to management as soon as possible during the shift • Ensure the ongoing effectiveness of existing risk controls
1 -5	Low Risk	• Take action when necessary and ensure risks remain low by verifying the continued effectiveness of existing controls • Record risks and monitor for changes and control risks as needed

Statistical analysis:

The statiscal analysis of the data was carried-out using SPSSPC+ using Chi^2-test for study the incidences of the different risk hazards among different patterns under the study.

Results

According to the study of risks on the chemical transportation by truck from Alexandria to idku and analysis of these results using SPSSPC+ using Chi^2-test and the rout risks for the distance and divide the route into four zones and analysis the risks in every zone

Risk analysis

Activities causing risks

The results on the most activities causing a higher risks during chemicals transportation using truck trailer from Alexandria to idku site. Cleared that, the risks differ significantly ($P < 0.01$) differ among different activities used during the chemicals transportation. (Table, 6)

The most activities of a highest risk includes driving on the roads 19 (47.50 %), Loading and checking/securing the lashing/ valves after finish loading 4 (10 %), driving to the clients 3 (7.50 %), driving into the site 3 (7.50 %), Stopping & shutting the truck down 3 (7.50 %),

Table (6): Activities causing risks during chemicals transportation using truck trailer from Alexandria to idku site.

Activities causing risks	**Number of incidences**	
	Number	**%**
Pre -Start	29	21.97
Driving into the site	8	6.06
Driving on the site (empty)	3	2.27
Stopping & shutting the truck down	8	6.06
Exiting the truck	5	3.79
Loading and checking /securing the lashing/ valves after finish loading	4	3.03
Driving out of the gate	2	1.52
Driving on the roads	73	55.30
Total	132	100

$Chi^2 = 22.45$** ** = Significant at ($P < 0.01$).

Hazard identified:

The results on the most hazard identified causing a higher risks during chemicals transportation using truck trailer from Alexandria to idku site. significantly ($P < 0.01$) among different activities used during the chemicals transportation. (Table, 7).

The most activities of a highest risk includes damaged stairs **2 (5 %) and** not wearing PPE 3 (7.50 %).

Table (7): Hazard identified during chemicals transportation using truck trailer from Alexandria to idku site.

Hazard identified	Number	%
No availability	2	1.52
Invalid ID or permits	3	2.27
Driver fatigue	4	3.03
Driving under alcohol or drugs	1	76.
Driver qualification	6	4.55
Vehicle conditions	5	3.79
ISO TANK conditions	2	1.52
traffic on the gate	4	3.03
seat belt	3	2.27
driving fast	4	3.03
not holding the hand brakes	2	1.52
wet truck wires	6	4.55
Wet / slippy stairs	3	2.27
Damaged stairs	3	2.27
not wearing PPE	3	2.27
gate opening not sufficient	5	3.79
Chemicals Spillage	4	3.03
non secured manhole	4	3.03
non secured /adequate or broke down valves	4	3.03
Leaving the trucks running/opened cabin	4	3.03
Tire explosion	4	3.03
Flat tire	4	3.03
Mechanical breakdown	4	3.03
Sliding due to Wet/slippy /greasy/oily road	2	1.52

Truck emissions out of limit	2	1.52
Wrong turn.	2	1.52
Wrong exceeding	2	1.52
Improper road condition.	3	2.27
Wrong maneuvering	5	3.79
Absence of lights(front back tuning &ext.).	3	2.27
fuel tank leaking	4	3.03
electrical short	4	3.03
Accident on the road	5	3.79
Traffic congestion	5	3.79
Mist/Sand storm	3	2.27
Rains/ over floating	4	3.03
Tank monitoring	4	3.03
Total	132	100

$Chi^2 = 15.47^{**}$ ** = Significant at (P < 0.01).

Hazard effect (Risk):

The results on the most hazard effect (Risk) during chemicals transportation using truck trailer from Alexandria to idku site cleared that, it differ significantly (P < 0.01) among different activities used during the chemicals transportation.

The hazards effects of a highest risks includes Accident might causing damage to the truck injury o the diver and surrounding it also may cause chemical spillage **6 (15 %),** Delaying or Accident 4 (10 %), accident 2 (5 %), fire 2 (5 %), electrical shock, burning **2 (5 %),** injury due to falling **2 (5 %). (Table, 8).**

Table (8): Hazard effect (Risk) during chemicals transportation using truck trailer from Alexandria to idku site.

Hazard effect (Risk)	Number	%
• Customer satisfaction will be affected	3	2.27
• Client production can stop	3	2.27
• Accident due to sleepy driver	3	2.27
• Accident due to drugs and alcohol influence	3	2.27
• Accident due to lake of qualifications	3	2.27
Mechanical failure	3	2.27
• Poor operating conditions	3	2.27
• Unsuitable vehicle for the trip	3	2.27
Hand injury	3	2.27
• Poor tires' conditions	3	2.27
Tank explosion	5	3.79
Tank spillage	3	2.27
• Tank rolling over	3	2.27
• accident due to traffic	3	2.27
• accident due to loose seat belt	3	2.27
• accident due to hitting someone	3	2.27
• accidents due to truck movement	3	2.27
• electrical shock, burning	3	2.27
• injury due to falling	2	1.52
• accidents due to sharp edges	2	1.52
• accidents due to sudden movement of lashing equipment	2	1.52
• Injury due to contact with chemicals	2	1.52
accident due to traffic	3	2.27

• accident due to being stuck	3	2.27
Environmental accident	3	2.27
• Contamination to water	3	2.27
• Soil contamination	3	2.27
• Agriculture contamination	3	2.27
• Population injury or death	3	2.27
• Petrol station explosion	3	2.27
• Truck Stolen	3	2.27
• Environment air pollution	3	2.27
• Accident might cause damage to the truck	3	2.27
• Injury o the diver and surrounding	3	2.27
• Chemical spillage	3	2.27
• Accident due to mechanical fail	3	2.27
• Delay due to repair	2	1.52
• Air pollutions	2	1.52
• Accident might cause damage to the truck	3	2.27
• Injury o the diver and surrounding	3	2.27
• Chemical spillage	3	2.27
• Accident due to lake of visibility	3	2.27
• Delaying of arrival	5	3.79
• Accident	5	3.79
Total	132	100

$Chi^2 = 15.42^{**}$ ** = Significant at ($P < 0.01$).

Risk analysis:

The results observed in (Table, 9) on risk analysis level cleared that, the risk analysis differ significantly among risk level ($P < 0.01$).

The negligible risk level observed in likelihood 40 (100 %), severity 1 (2.50 %) and LS was 1 (2.50 %).

The simple risk level observed in severity level 18 (45 %), and LS reached to 15 (37.50 %).

The minor risk level observed in severity 16 (40 %) and LS 16 (40 %). While, the major risk level observed in LS 7 (17.50 %) and in severity reached to 2 (5 %).

Table (9): Risk analysis level among risk level during chemicals transportation using truck trailer from Alexandria to idku site..

	Frequency	Percent
Unlikely	9	36.0
Possible	13	52.0
Likely	3	12.0
Total	25	100.0

$Chi^2 = 14.55$** ** = Significant at ($P < 0.01$).

Existing control measures

The results observed in (Table, 10) cleared that , the existing control measures against risk differ significantly ($P < 0.01$) among different drivers.

The highest existing control measures observed in Premobilization safety check of the truck 8 (6.70 %), Apply Spillage emergency plan 4 (3.30 %), Escort is required to control the trip 4 (3.30 %), Ensure your vehicle is suitable for the intended trip 4 (3.30 %), Journey management plan is required 4 (3.30 %)

Table (10): Existing control measures to avoid risk during chemicals transportation using truck trailer from Alexandria to idku site.

	Number	Percent
always keep MSDS copy in your cabin	1	.8
Apply chemical spillage emergency plan	1	.8
Apply Emergency if there is spillage	1	.8
Apply Hazardous waste management plan	1	.8
Apply Random tests	1	.8
apply safety violations penalty	2	1.7
apply speed limit	1	.8
Apply Spillage emergency plan	4	3.3
Apply work instruction	1	.8
Call Emergency response team	1	.8
call supervisor for guidance and help	1	.8
Check if Suitable for chemical	1	.8
Check the maintenance done	1	.8
Check the regular service and have been completed	1	.8
Chemical classification and hazard (MSDS required)	1	.8
Chemical communications place card	1	.8
Confirm minimum pressure before departure of loading station by qualified Person	1	.8
Do not drive the vehicle if it has unsafe operating conditions	1	.8
Driver training required.	1	.8
Emergency spillage kit is required	1	.8
ensure that is no water in hand or in contact	1	.8
Ensure tires are in good conditions (air pressure, tread depth, right size)	1	.8
Ensure your vehicle is suitable for the intended trip	1	.8
Escort is required to control the trip	4	3.3
Escorting & travelling with the ISO tank from up to loading site either	1	.8
fasting of seat belt	1	.8
fire extinguishers	1	.8
Follow the approved working hours	1	.8
Follow the road regulation	1	.8
Follow the speed limit	1	.8

Follow up and control the truck by using GPS trucking system	4	3.3
follow-up of tire preventive replacement	1	.8
holding the hand brakes when stopped	1	.8
If level/ pressure exceeds normal limit, truck to return to loading station to minimize pressure.	1	.8
If pressure relief valve opened, stop in secure place and call emergency response team to take proper actions.	1	.8
If trip time exceed 2 hrs., stop at least for one time in secured place and measure pressure and temperature as per qualified person instructions.	1	.8
Iso tank condition	1	.8
Journey management plan is required	4	3.3
Keep boot laced and tied and wear mandatory PPE.	1	.8
Keep surfaces and boots as free of oil, water and mud as possible.	1	.8
Maintenance documents required	1	.8
Make sure pathways are clear of obstacles or debris.	1	.8
making sure all papers are ready and valid and all papers/permits are issued	1	.8
Monitoring the tank pressure during transportation must be controlled by qualified person	1	.8
MSDS must be provide to the driver and training on it	1	.8
Never come to work or commence driving/operating mobile equipment when unfit for work.	1	.8
Never leave the truck running or let your cabin open and leave	1	.8
Notify your supervisor if you are stressed and need to take time off	1	.8
Notify your supervisor if you feel unwell or taking any medication before commence work activities.	1	.8
Obey to client/site instruction and wait for your turn away from the gates	1	.8
Obey to site instruction and wait for your turn away from the gates	1	.8
Obey to site speed limits if N/A adhere to 20 Km/hrs. max	1	.8
Obey& follow-up of emergency plan	1	.8
Obey& follow-up of preventive maintenance	3	2.5
Obey& follow-up of truck maintenance	1	.8
Only competent and authorized drivers can drive vehicles.	1	.8
Operation Dept. staff training to our system	1	.8
Park in safe assigned area	1	.8
parking on the side of the road	2	1.7

placing of reflecting triangles and cones 100 meters behind the trailer	1	.8
placing wheel chocks	1	.8
Pre-Planning.	1	.8
Pre-trip inspection	1	.8
Premobilization safety check of the truck	8	6.7
Pressure and relief valve check	1	.8
Regular & preventive maintenance	1	.8
Road risks calculation	1	.8
Secure spillage area.	1	.8
slow down	2	1.7
Spillage kits is required	1	.8
Spillage kits is required	1	.8
Stay in your truck	1	.8
Tank certificate is required	1	.8
Tank inspection certificate	1	.8
Trained driver and familiar with MSDS of HAZMAT that he is carrying training to emergency response and spill preventing plan	1	.8
Training the driver	1	.8
Training the driver in defensive driving	1	.8
Training the driver to defensive driving	3	2.5
Training the driver to defensive driving.	3	2.5
Training to driver	1	.8
Transportation risk assessment required	1	.8
Truck emissions measuring tests according to the environmental law	1	.8
turning on hazard lights	1	.8
turning on hazard lights,	1	.8
Use proper PPE	1	.8
Use three-point contacts when climbing stairs.	1	.8
Wait till the gate free during entrance & ask for guiding persons see both sides if you can’t see	1	.8
Wait till the gate is free during entrance & ask for guiding persons see both sides if you can’t see	1	.8
Watch for wet surfaces in adverse weather conditions &make sure your foot is seated on the stair in a correct way	1	.8
Wear PPE(suitable Glove – vest – safety shoes – helmet – safety glasses)	1	.8

wearing a proper PPE	1	.8
Zero limit for drugs and alcohol.	1	.8
Total	120	100.0

Chi^2 = 25.42** ** = Significant at (P < 0.01).

Risk residual:

The results observed in Table (11, 12, 13) cleared that, the risk residual differ significantly (P < 0.01) among different degree of the risk.

The higher risk residual according to **likelihood** observed in Medical treatment (off site) 20 (80 %), followed by Minor injury (first aid on site) 3 (12 %) and the lower risk residual observed in lost time injury 2 (8 %).

Meanwhile, the higher risk residual according to **severity** observed in minor severity 11 (44 %), simple 8 (32 %)and the lower severity observed in major severity 2 (8 %) and catastrophic 2 (8 %).

Meanwhile, the higher risk residual according to **LS** observed in moderate LS 23 (72 %) and Minor 7 (28 %).

Table (11): Risk residual during chemicals transportation according to likelihood using truck trailer from Alexandria to idku site.

	Frequency	Percent
Minor Injury (first aid on site)	3	12
Medical treatment (off site)	20	80
Lost Time injury	2	8
Total	25	100

Chi^2 = 10.22** ** = Significant at (P < 0.01).

Table (12): Risk residual during chemicals transportation according to severity using truck trailer from Alexandria to idku site.

	Frequency	Percent
Simple	8	32
Minor	11	44
Major	4	16
Catastrophic	2	8
Total	25	100

$Chi^2 = 11.23$** ** = Significant at (P < 0.01).

Table (13): Risk residual during chemicals transportation according to Liklihood and severity using truck trailer from Alexandria to idku site

L	Severity			Required response
	Inspection priority	No	%	
1to4	Minor	7	28	Some risk controls may still be justified Manage the process by routine job Identify hazards and implement the control as required
5to9	Moderate	23	72	Further Risk Reduction Measures should be considered to ensure risk is ALARP Complete risk assessment; Identify hazards and implement the control to reduce risks; Management responsibility must be defined.
		25	100	

$Chi^2 = 10.56$** ** = Significant at (P < 0.01).

Distances of transportation using truck trailer from Alexandria to idku site.

The results observed in Table (14) cleared that, the distances of transportation affected on the risk incidences during transportation significantly ($P < 0.01$).

The higher risk incidences observed in the long distances of the transportation.

The higher risk incidences observed in distances over 54 – 71.50 Km and reached to 15 (37.50 %) that resulted from accident and delay, followed by the incidences at the distances ranged from 18 – 53.50 Km as its incidences reached to 10 (25 %) and constituted in fire incidences.

Also the distances of 36 – 53.50 Km showed risk incidences of 10 (25 %) that constituted in loosing of the package.

The lowest incidences of the risks observed at the distances ranged from 1 – 17.50 Km and constituted in Environmental accident due to spillage and rejected by the client to load.

Table (14): Effect of distances on the incidences of risk .

Distances	Type of risks	Number	Risk Incidences
1 – 17.50 Km	Environmental accident due to spillage and rejected by the client to load	5	12.50
18 – 35.5 Km	loosing of the package	10	25
36 – 53.50 Km	Fire	10	25
54 – 71.50 Km and over	Accident and delay	15	37.50
Total		40	100

$Chi^2 = 15.45^{**}$ ** = Significant at ($P < 0.01$).

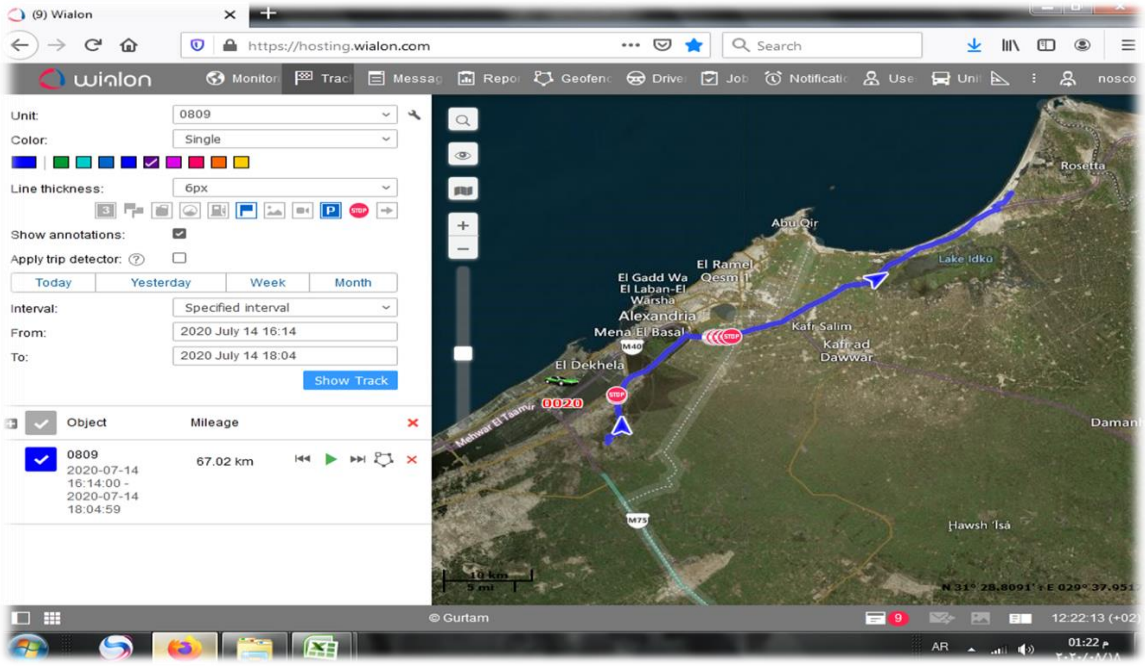

Figure (1)the route from Alexandria site to idku

The driver take anathetics:

Table 8 cleared that, the most importants anthetics drugs includes cocine in urine, Amphetamine in urine, Benzodiazpine in urine, Opiates (Morphine) in urine, Cannabinodes and Tramadol in urine.

The results cleared also, no any driver take anathetics drugs during driven its cars. (Table, 14).

Table (14): Results of urine analysis of the drivers for examination of drug residues:-

Drug abuse screening	Detectable level	Number of driver examined	Results
Cocine in urine	300tg/ml	40	Not detected
Amphetamine in urine	1000 ng/ml	40	Not detected
Benzodiazpine in urine	300 ng/ml	40	Not detected
Opiates (Morphine) in urine	300 ng/ml	40	Not detected
Cannabinodes	50 ng/ml	40	Not detected
Tramadol in urine	200 ng/ml	40	Not detected

Discussion

Transportation of petroleum products by road truck creates numerous opportunities for hazardous materials to be accidentally released into the environment. chemical properties, sensitivity of host environment and proximity of human presence such releases have safety and environmental consequences. (Nijolė, 2018)

Transportation of petrol is control by the petrol companies, where each company had assigned specific vendors (known as tanker company) to transport the product to their own petrol stations. Petrol station is required to inform the refinery depot that their product need to be refilled and the order will be sent out to the tanker company. (Syimir et al., 2018b).

The results on the risk analysis cleared that, the most activities of a highest risk includes driving on the roads 19 (47.50 %), Loading and checking/securing the lashing/ valves after finish loading 4 (10 %), driving to the clients 3 (7.50 %), driving into the site 3 (7.50 %), Stopping & shutting the truck down 3 ,(% 7.50)

while, The results on the hazard identified, the most activities of a highest risk identified were driver qualification 6 (4.55 %), gate opening not sufficient 5 (3.79 %), accident on the road 5 (3.79 %) and traffic congestion 5.(% 3.79)

Awareness level of a worker on occupational risk is closely related to providing proper knowledge and understanding of the subject. Providing an effective of training module would be the best recommendation to improve the awareness level of the tanker driver. Applying a module based on the capability to learn (education level) and practical implementation can further increase the understanding of the employees on chemical hazard (Sokas et al., 2009). A structured training program has been known to help improve a person skill and overcoming their weaknesses (Niaz et al. (2015 and Payal et al., 2017.(

While, The results on the Hazard effect (Risk) cleared that, The hazards effects of a highest risks includes tank explosion 5 (3.79 %), delaying of arrival 3 (3.79 %), accident 5.(% 3.79)

The risk analysis results cleared that, The possible risk reached to 13 (52 %), followed by unlikely 9 (36 %0 and the likely risk reached to 3 (12.(%

While, the severity level showed that, catastrophic level reached to 11 (44 %), Major level reached to 9 (36 %) and the lower severity observed in minor level 5 20) .(%

While, the LS levels showed that, the higher LS risks observed in High LS 16 (64 %), followed by moderate LS 8 (32 %) and Extremely high as it reaced to 1 (4 %), and in minor risk reached to 0.(% 0)

The risk level of petroleum oil attributed to the organic compounds found in petroleum oil as ethanol, methyl tert-butyl ether (MTBE), benzene, toluene, and xylene (BTX) might be emitted through evaporation while pumping fuel in a vehicle capable to evaporate easily under room temperature

The results agreed with those of (Kamal et al., 2016; Mitri et al., 2015) where they reported that, Occupational exposures to ethanol, methyl tert-butyl ether (MTBE), benzene, toluene, and xylene (BTX) lead to high percentage to get lung cancer, bladder cancer and leucocythemia. Long-term exposure to VOCs might associate with

gene mutation cell-damaging and increased risks of cardiopulmonary mortality (Zhu et al., 2012). Humans may expose to BTXs by breathing polluted air, their dietary intake and through dermal contact (Gungormus et al., 2014 and Liao et al., 2018) .

The health effects that come from exposure to VOCs and BTXs are raising concern for worker handling the petrol product such as petrol pump attendance, petrol tanker driver and pump station customer (Edokpolo et al., 2014 and Hilpert et al., 2015) .

Legal and standard were enhanced to minimize the exposure of petro chemicals on petrol tanker driver in order to reduce the risk of having any health effect. Permissible exposure limit (PEL) is the limit of exposure which is considered safe to work at a given time. PEL is separated under 2 categories which are Time Weighted Average (TWA) of 8 hours working exposure in a day and short-term exposure limit (STEL) of 15 min of working exposure in a day (NIOSH, 2015) .

The result son the existing control measures cleared that, the highest existing control measures observed in Premobilization safety check of the truck 8 (6.70 %), Apply Spillage emergency plan 4 (3.30 %), Escort is required to control the trip 4 (3.30 %), Ensure your vehicle is suitable for the intended trip 4 (3.30 %), Journey management plan is required 4 (% 3.30)

This results agreed with those of (Mitri et al., 2015), where they reported that, the Quantitative risk analysis and potential to assess the safety level of the tunnel and propose additional measures for improvement in order to avoid accidents. Such effort in obtaining accurate decisions, many researchers have emphasized the need to evaluate tunnel safety in a systemic perspective .

While the result son the risk residual cleared that, The higher risk residual according to likelihood observed in Medical treatment (off site) 20 (80 %), followed by Minor injury (first aid on site) 3 (12 %) and the lower risk residual observed in lost time injury 2.(% 8)

Meanwhile, the higher risk residual according to severity observed in minor severity 11 (44 %), simple 8 (32 %) and the lower severity observed in major severity 2 (8 %) and catastrophic 2.(% 8)

Meanwhile, the higher risk residual according to LS observed in moderate LS 23 (72 %) and Minor 7.(% 28)

Transportation of petroleum products by road truck creates numerous opportunities for hazardous materials to be accidentally released into the environment. chemical properties, sensitivity of host environment and proximity of human presence such releases have safety and environmental consequences. (Nijolė N,2018)

The results on the distances of transportation using truck trailer from Alexandria to idku site cleared that, the higher risk incidences observed in the long distances of the transportation. The higher risk incidences observed in distances over 40-Km and reached to 15 % and constituted in accidents and delay , followed by the incidences at the distances ranged from 30 – 39 Km and constituted in fire incidences. While, at the distances ranged from 20 – 29 Km the risks incidences reached to 10 % and constituted in loosing and package 25.%

The lowest incidences of the risks observed at the distances ranged from 10 – 19 Km and constituted in Environmental accident due to spillage and rejected by the client to load .

This results agreed with those of (Yang et al., 2010) where they revealed the correlation between the location of HAZMAT incident and the total distance of transportation i.e., from the shipment origin to the incident location. This finding has become the basic guideline to assist the authorities to prepare a safety plan to prevent the occurrence of the same incident in the future.

Occupational Safety and Health Administration (OSHA) regulations enforced the employer to provide training to prepare the tanker driver with sufficient input regarding their working hazard (Rogério dos Santos Alves and Alex Soares de Souza, 2014) .

While, The results on the driver urine analysis for detection of anathetics cleared that, the most important anthetics drugs includes cocine in urine, Amphetamine in urine, Benzodiazpine in urine, Opiates (Morphine) in urine, Cannabinodes and Tramadol in urine. Also, the results cleared also, no any driver take anathetics drugs during driven its cars.

This results attributed to the most of petrol companies make a periodical analysis for their drivers against any anthetics drugs to avoid any accidents results from taking the drivers the anathetics drugs.

The results agreed with those of (Syimir et al., 2018b), where they reported that, the Tanker company will send out their petrol tanker driver to the refinery depot to collect the product based on the order and drive out the product from the depot to the respective petrol station where the tanker driver is required to transfer the product into the petrol stations storage tank. Petrol tanker driver must be of safe conditions and not take any anthetics drugs that may cause accidents to the drivers.

Also, Studies showed that level of awareness of tanker driver had a significant correlation with the employee's reaction to hazard while working (Rogério dos Santos Alves and Alex Soares de Souza, 2014; Zainal Abidin et al., 2018).

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