



CHAPTER IV

SURVEY AND AUDIT OF SHIFT HANDOVER FOR SYSTEM ANALYSIS

4.1 Objectives of the survey and audit

To develop and improve effective shift handover by aiming at:

- Problem that might occur during shift handover
- Effective communication by both written and verbal messages.
- Explore some visual display to provide effective shift handover as Log book/log sheets, electronic file, procedure/guidelines

In order to discover precisely what could be mistaken during shift handover, between incoming and outgoing operator in the refinery. The points of consideration and conducting by the survey instrument was prepared and administered to the operation target by being practiced from Refinery in Eastern region of Thailand. The output from the survey was then analyzed, therefore the results of analysis were used to develop a new Handover system and fulfill the post development questionnaire, which was designed to obtain information of shift handover system in their refinery.

4.2 Survey Instrument Preparation:

In order to prepare the survey instruments, the questions for surveying of oil refinery in Thailand. It would be separated into two points of view with different objectives. The first part, question shall involve management such as production unit manager, area unit managers and shift supervisor.

4.3 Pre development of Questionnaire

Here are some factors to consider, the questions in questionnaire must contain this sort of following factor in order to collect the most useful information for further development on effective shift handover,

- **Time allocation to conduct shift handover**

This issue shall concern time for outgoing operator to prepare the shift handover report, moreover, to minimize time to write up report despite of load of works during the shift.

Time allocation for shift change meeting should be adequately given or transfer message from one shift to other shift with the effective manners. However, some barrier factor could be presented such as, people who prefer to use company transport would like to shorten the shift handover meeting so that they can go home early.

- **Shift Logbook:**

The shift report or logbook shall have precise and clear message and reachable for many people to understand. Use of foreign language, such as English, is common in refinery indeed. Yet, the problem is the uses of language must be well considered, specifically English, which could form a barrier in the communication.

- **Shift Handover**

There are many ways to transfer message throughout from one person to one person. However, probably the most effective method for shift handover would be Face-to-Face communication for individual communication. Other methods also could be observed such written message on white board, which provides opportunity for everyone in the next shift to read it. Or handover reports send via electronic mail box system to everyone in the shift.

Besides, the human error or factors shall be concerned by fatigue of each operator such as some of outgoing operators are already tired from their shift activity or illness and cannot or tend to find their way home as soon as possible when the incoming operator appear for shift change. Shift cycle is also another factor that might interrupt the effective shift handover.

4.4 Bias

The purpose of the researchers must avoid of various types of bias by careful thought with regards to selection of appropriate and reasonable question. With consideration, the purpose of each questions that state in and what kind of feedback the participants are willing to answer.

4.5 Validity

Once the questionnaire has been developed and pilot test was ongoing. The test for face validity by the working colleagues of the researchers whose position are the plant operator and content validity to Operation Manager, Criterion validity and Construct validity were fairly satisfying feedback.

4.6 Ethical Issue

The research had been taken the step of permission to ensure minimum ethical issues in this research project. For instance, the user had been informed about research project to operation manager to give and allow to do pilot test. Questions were based on the necessity and must be an inclusion response indicating whether the choice is acceptable or not. By quoting, with little notice of this information is utilized for educational purposes and further development.

4.7 Background of Audit

The audit has developed and implemented by using “Effective Shift Handover” from research by Ronny Larder, a Charter Occupational Psychologist at The Keil Centre, Edinburgh. By revision and addition of some details has also translated into Thai for brief Auditors and training operators in the next time.

Audit form has been created by the committee for convince for the Auditors and Questionnaires for operators to give the feedback or some comments to advise on shift handover.

Shift Arrangement of Thai lube base has been divided into 4 shifts, which are A, B, C and D working hours per shift is 12 hours. There are 14 persons per one shift, whose have 12-13 year of working experience.

One shift including Shift Sup, Lead Team Operator and Team Operators have been assigned to look after area response in refinery by having the shift rotation and working hours from 07.00-19.00 hours for Morning shift and 19.00 – 07.00 hour for Night shift. Incoming shift team would normally come to work at least 30 minutes before the shift change; each shift has 2 days off.

For those who recently on night shift duty would have 4 days off. Time allocation shift handover is one house, which starts from 6.30-7.30 hours for Morning Shift and 18.30-19.30 hours for Night Shift.

4.8 Method statement

- Conducting seminar session and briefing to introducing Effective Shift Handover for team of Auditors such as effective shift handover information, Auditing form and questionnaire for Audi tees.
- Team of Auditor has been selected and announced by RO (Process Operations Manager) including 8 people from many discipline such as there are 6 operating personnel and 1 Safety and 1 Technologist.
 1. Operation Advisor, 43 years of work experience in Oil Refinery.
 2. Operation personal, 12 years of work experience in Oil Refinery.
 3. Operation personal, 12 years of work experience in Oil Refinery.
 4. Operation personal, 12 years of work experience in Oil Refinery.
 5. Operation personal, 12 years of work experience in Oil Refinery.
 6. Operation personal, 12 years of work experience in Oil Refinery.
 7. Safety engineer, 13 years of work experience in Oil Refinery.
 8. Process engineer as known as Technologist, 12 years of work experience in Oil Refinery.
 9. Researcher, 4 years of work experience in Oil Refinery.

- Arranged the program and schedule for auditing and area to looking at and also area to be audited each shift until completed 4 shifts by audit 2 shifts per time.
- Each Auditor must find out and observe by following audit sheet which team of committee has reviewed and designed to for audit to make some comment for further improvement.
- Gathering all the results from each auditor and making progress report of summary to operation manager by pointing out what is the best practice for shift handover and what is need to be improved for the further action.
- Conduct seminar meeting for analysis of the results from audit and discussion for further action prior to achieve Effective shift handover.

4.9 Minimum Standard for Effective Shift Handover

From the “Effective Shift Handover” was written by Ronny Larder can be included as the list below:

4.9.1 the responsibility of management and department in the organization:

- Be even more aware to the team in effective shift handover including problem during operation and risk that might occur during the shift change especially major shutdown activity, plant start up and shut down activity.
- Generate procedures/guidelines which involves in effective shift handover and review and approved by concerned people from many discipline prior to proof that guideline could be followed and implemented on site.
- Pay special attention to shift handover for those team members who has been in long absence from work to understand the plant condition and what has been done in the past and in the action plan for the production side and any maintenance outstanding works that has been left out to continue in the shift. In case Plant Maintenance activities mentor of the program must give the clear instruction to those new employee or those who has less experience in the area response.
- Construct key information for the incoming operation team to understand and update mental model about plant status condition of plant.
- Encourage and support the communication method for team to use logbook, or visual displays that has been designed for operator needs.
- Develop and train operator’s communication skills such as English writing skill or high impact presentation.

4.9.2 Role and responsibility for Shift Personal

- Shift handover by using verbal communication to transfer message must be face-to-face and two-way communication including aid of visual to explain to incoming operation team.
- The language should be uncomplicated, clear and understandable to all.
- Log book/log sheet must be used during shift handover in any situation.
- In coming team must record detail to the outgoing team for better understanding during shift handover.
- For those who has been absence for long period, outgoing team must concluded what has happened in the past to give clear understanding to those people to continue their work safely and assure readiness to follow the next production plan in their shift.
- The format of log book/log sheet required to be constructed in essential section which needs to fill in and separate by heading title as Safety/Environment, Maintenance complete & incomplete, abnormal conditions, Plant Status etc.
- The message on log book/log sheet must be precise and clear for understanding and must have overview plant condition from now and the future plan.

Shift handover meeting must be conducted for the purpose of cross checking whether everyone in the team understand in same way as the outgoing team have explain in the shift handover or not and what items has not been mentioned in the meeting as well as suggestions to be discussed or comment to be advised.

4.10 Shift Handover Measurement

Auditing: From the observation, the Auditors filled comment and put some details from their observation as the following table below.

Header/section/objective	Observation/Interview	What have been found and suggestion for further action.
1. Place to conduct shift handover is proper and no disturbed	<input checked="" type="checkbox"/> appropriate <input type="checkbox"/> in appropriate	It can be appropriate and inappropriate in term of some noise that might disturbed from 26 people in the control room were discussed and it can be acceptable
2. Time for shift handover (Normally 5-15 minutes) for cross checking and ensure that all essential information is clear and well understood.	<input checked="" type="checkbox"/> Adequately <input type="checkbox"/> Not enough	Good use of time in – 20 minutes.
3. The method of face- to –face communication has been use during shift hand over or not? In term of effective two way communication and better understanding	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Found in area of Offsite/Movement operators need to gather around for further discussed.
4. Any feedback or question between incoming and outgoing team during shift handover to ensure that both team has understand and well clear about the message that has been transfer and received.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Minority of team member still do not wish to give feed back or question only just listen to what outgoing team give the detail during shift handover.
5. The use of language is too complicated and not understands by all users to access log.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	
6. Has log book been included during shift handover or not? In prior to ensure that all information is correct and not miss out.	<input checked="" type="checkbox"/> Yes <input checked="" type="checkbox"/> No	1 Yes it has been use but only less content 2. Some people don't used it at all
7. The method of shift handover between operator who has high experience and operator who has less experience is well appropriate or not?	<input checked="" type="checkbox"/> Appropriate <input type="checkbox"/> Inappropriate	Most of the operators in team has similar year of service of 8-13 years.
8. The method of shift handover for transferring information to those who has been absence from long period of work has been appropriate or not?	<input checked="" type="checkbox"/> Appropriate <input checked="" type="checkbox"/> Inappropriate	1 Shift Sup/LTO are appropriate 2. For Team operators most of them have not conveyed the message from the past history.
9. Are the potential risk have been identify during shift handover meeting?	<input checked="" type="checkbox"/> Appropriate <input checked="" type="checkbox"/> Inappropriate	1 only short discussion but not repeat or ensure the risk that might be happen

Table 4.1: Audit result

Header/section/objective	Observation/Interview	What have been found and suggestion for further action?
10. Does the content of Log book has been identified in key area of important item or not? Such as safety/environment, ongoing activities, maintenance, plant production, etc. To ensure that essential message has been passed though out the shift.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	1 Some people did not have log sheet 2. Nothing special about important part most of the job are general routine activities 3 Write only plant production
11. Does Log book contents precise and not complicated to all people can read and understand or not?	<input checked="" type="checkbox"/> Yes <input checked="" type="checkbox"/> No	1 Content is not clear 2. Content is not well organize and little detail
12. The usage of language is written in Thai or English?	<input checked="" type="checkbox"/> English <input checked="" type="checkbox"/> Thai	1 Shift Sup/LTO use English in Electronic file but for personal log book mixed between Thai and English 2 Operator mixed Thai and English
13. Is there any attached of drawing or production plan in logbook to identified the clear activity of the shift?	<input checked="" type="checkbox"/> Yes <input checked="" type="checkbox"/> No	1 Some operator has 2. Shift Sup has some drawing or plan attached in the log.
14. Does shift sup's Electronic log book have been set of standard of topic to put in the data?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	No data found
15. Does Shift sup's Electronic log have been store in the Network for other person can be access or not?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Yes, in the Network share drive to be access
16. Is the time allocated for Shift Meeting adequately or not?	<input checked="" type="checkbox"/> Adequately <input type="checkbox"/> Inadequately	
17. Is the potential risk that might happen have been identified during Shift Meeting?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	1 Sometimes 2 Not often need
18. Do the operators have gone back to read the log book and cross checking information to one other or not after the verbal communication has been done during shift handover?	<input checked="" type="checkbox"/> Yes <input checked="" type="checkbox"/> No	1 For Board Man has log sheet on the control panel can be access and readable at all time. 2 For Field operators did not do it and some never gone back to revise.

Table 4.2: Audit result

- **Other Comment and advise:**

The suggestions from the auditor's team committees are following list below:

- 1 Need to (structured) format of log book/log sheet for standard type for both operators and Shift Sup/LTO
- 2 Data from Board man need to include field activities do not call Field operators for information during shift handover
- 3 Upcoming team needs to ask or feedback about information that received from outgoing team and need to know the history o recent activity. Not only just the listener.
- 4 Upcoming team should make a short note to remind themselves.
- 5 In case of those operators who are recently absent from long period or long vacation, the outgoing team must prepare the past history at least 2 days activity back to capture those people to understand current situation and also to align mental model before start their work safely.
- 6 Verbal and face-to-face communication necessitates log book/log sheet in order to ensure that all information provided and clear to all.
- 7 During Shift handover meeting, sometimes each of operators has to conclude their information transferred from outgoing team to cross checking and ensure that everyone in the team understands in same way and not missing any information although it may consume some of working hours.

- **Questionnaires**

The questionnaire was designed to ask operators opinion and suggestion prior to improve the effective communication including the audit result from the committee.

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The questions contents within the pre-development questionnaire refer to 3 main key areas to analyze:

- Time allocation to conduct shift handover
- How to conduct shift handover
- Log boor or log sheet system

Also allow the participant to suggest how to improve effective shift handover system and log book or log sheet for user's satisfaction.

There were 22 questions to answer, for more information on how each question was worked and arranged.

- The first question was to ask the operation team whether they have enough time to provide for shift handover. By constructed a closed question to declare on how they feel.

- The second question was design to ask the over-lap time to provide for shift handover, regarding to each organization has their own standard in shift handover and not equally the same for all. Therefore, it depends on factor to be concluded such as, company shuttle buses have limited of waiting time. Or some employees wish to bring their own vehicle to work. Or in other organization consider the extra time require for shift handover to be paid for overtime pay. By giving three choices to be answer.
- The third question was asked opinion and satisfaction for the team of time to be conduct shift handover.
- The forth question was asked to ensure that everyone in the shift have all the information and understand the same way and correct before start working.
- The fifth question was designed to analyses whether all information have been precise and only important message to be input in shift handover material such as log book or log sheet.
- The sixth question needs some opinion from team to feel that during the emergency plant shutdown and time schedule for operation is very tight. Time for shift handover is not enough to gather all information and not ready to prepare due to continuous workflow.
- The seventh question was straightforward to ask for time allocated to prepare resources or material for shift handover or not.

In section B: The proposed in this section is to ensure that communication has not been deviate or misunderstanding including verbal communication with visual aid of diagram and written material support during shift handover. Also need to know the whether logbook has been constructed properly or match with user satisfaction. Need to know the use of language to be put in the written material is not complicated.

- The eighth question was a close question to find out whether shift handover work instruction or guidelines have been provided or not.
- The ninth question was design to ask opinion on if there is no guideline and then how do they know whether they have done the right thing or not.
- The tenth need to ask on team competency of language skill in prior to be able to communicate in foreign language. Or find out user's satisfaction whether foreign language is suitable to put in the logbook or not.
- The eleventh question was designed to determine the effectiveness of shift handover when using face-to-face communication.
- The twelfth question was an open question to determine how often of two way communication have been used and also feed back to one another to exchange information or not.
- The thirteenth question needed to ask operation team whether they have been trained on procedures specifically in shift handover or not.
- The fourteenth question is designed to check and determine that shift handovers periodically monitor in prior to maintain or not.
- The fifteenth question asked operation team whether they understand about shift handover is an equal responsibility of both incoming and outgoing operator or not.
- The sixteenth question was similarly to the previous question but the different point is about the alert to the necessity for lengthier and more through handovers in

abnormal operations, when either person is new at the job, and when the taking over has been away from work for a few days.

In section C: This section was designed the questions to determine the expertise and communication skill to written up the shift handover report. Such as: Type of language to be use in written up the report. Moreover need to ask the support materials to be use during shift handover.

- The seventeenth question was designed to ask the use of language in writing logbook in organization. Such as Thai language or English language.
- The eighteenth question, was determine how well competence for the team in case of using foreign language in writing logbook to cover necessary items.
- The nineteenth question was to determine that a written support of handover materials is cover in necessarily detail and well proper constructed or not. Any additional detail shall be making.
- The twentieth question was a close question regarding to unusual occurrence that have been describe into logbook or not.
- The twentieth first question was an open question to determine whether in both written and verbal description of task and occurrences has been effort of the follow up or not.
- The twentieth second question was to ask them how often or familiarity of using information technology or new technology tools to help in handover method.

In section D: This section was designed for general comment or point of view to be making by the participant regarding to handover system.

The result from the questionnaire can be constructed in the table below.

Questionnaires can be found in APPENDIX 1

• Questionnaires Result on shift handover system:

A Time allocation for conduct shift Handover				
		Adequately	Inadequately	
1	Time for shift handover 30 minutes	89%	12.5%	
2	Time for shift meeting 15-20 minutes	80.3%	11%	
3	Time to prepare shift report or other document to support in 1 hour	90 %	10%	
B Conduct Shift Handover		Yes	No	
1	Is there any procedure regarding to shift handover?	54%	46%	
2	Face to face communication has been conduct	98%	2%	
	Any disturbance?	YES but can be acceptable		
3	Two-way communication has been conduct or not?	98%	2%	
4	IS there any training regarding to shift handover or not?	12.5%	83%	Unknown 5.3%
5	Do you understand that shift handover; teams have to be response to one another?	YES 70%	NO 30 %	
6	Have you ever considered that time extension of shift handover should be provided in the certain situation for example: <ul style="list-style-type: none"> • Plant start up and plant shut down • New employees • For those team member who take long holidays or been absence 	YES 91 %	No 9%	

Table 4.3: Questionnaire result

- **Questionnaires on log book/ log sheet for personal operator.**

The questionnaire was designed to ask operators opinion and suggestion in prior to improve the effective communication including the audit result from the committed. It can be divided in to 3 sections.

- Language to be input in log book
- Writing skill
- Standardization of the logbook.

The result from the questionnaire can be constructed in the table below.

Log Book or Log sheet				
1	What types of languages do you write in log book?	Thai 33%	English 69 %	Mixed 16%
2	Are comfortable in writing in English?	No 20%	Yes	Need more English writing skill 60%
3	Do your Logs have a set of standard format?	YES 89%	NO 11%	
4	Does your report have this following list?			
	4.1 Analyze and identified the risk that might occurred	Yes 64%	No	
	4.2Have some observation notice for the other to see	Yes 55%	No	
	4.3 Only general items to put in	Yes 37%	No	
5	Do you use computer to record your logs?			
	5.1 Often	7%		
	5.2 Sometimes	9%		
	5.3 Only in log book/log sheet	79%		

Table 4.4: Result from Questionnaires on log book/ log sheet for personal operator

4.11 Conclusion from audit

The result from the audit found that the working practices during shift handover have some best practice and some need to be improved.

Need to improve on certain topic:

- No standard procedure to be follows for effective shift handover.
- Log book/log sheet has not designated the important topic and concern issue that essentially need to shift handover.

- For team operator, the description in the log was not in details and cannot convey the message to the incoming operator to get clear point of view to understand the message or activity to be continue in the next shift.

Best practices are:

- For shift supervisor and Lead team operator have prepared the precise details for shift handover including detail for operator who has been absence for long period to understand the history and previous work and present also refer to daily, weekly operation plan to give clear instruction for the next shift including drawing of the outstanding maintenance activity and process instrument diagram for the team.
- Face-to-face and two-way communications have been conduct during shift handover.
- Shift handover meeting have been conduct before commencing their task, so that makes team member feel more comfortable and getting confident about their works in area of response and also cross checking one another for better understanding of their task and highlight activity have been stated.
- There is one hour for conduct shift handover, which is sufficient for the detail for the next shift to continue their work effectively.

The conclusion can be drawn from the result of Audit and questionnaire. It can be divided in to 2 aspects on to keep continue doing so and the other aspect that need to take action also need to be agree from committees to find out solution to be response as soon as possible.

- **Conduct shift Handover**

Items for the Best Practice are:

- Time allocation from shift handover is provided for 1 hour, which can be divided into 2 sections. It is Including 30 minutes for shift handover and another 30 minutes for shift team meeting. It can be considered as adequately and acceptable to be the best practice.
- During shift handover there have been conduct both face-to-face and two-way communication.
- Verbal communication has been using log book/log sheet to be including in the shift handover especially Shift Sup and Lead Team Operator.
- Incoming team have been taken short note for their reminder.
- For shift supervisor and Lead team operator have prepared the precise details for shift handover including detail for operator who has been absence for long period to understand the history and previous work and present also refer to daily, weekly operation plan to give clear instruction for the next shift including drawing of the outstanding maintenance activity and process instrument diagram for the team.
- During shift team meeting, Shift supervisor encourage team member to explain their takes and what are the activities need to take action in their shift for cross checking one another.

Items that need to be take action for improvement are:

- Place to conduct shift handover is quite disturbed because it has been holding the main control building but most of team member feel that it is acceptable for them.
- Some of team member operators is only listen not ask for question.
- Team operators often not concluded that are the highlight activity from their shift and status of plant for those who has been absence. Also the report doesn't refer to the past history so incoming team cannot capture the status in the past and from now.
- Field operators from Off Site team sometime do not come for shift handover so the information does not pass though the team.

Log Book/Log sheet

Items for the Best Practice are:

- Shift Sup and Lead Team Operator have input the detail of the report in Electronic report for shift supervisor. It contains over view of Process plant by using PI Program

Items that need to be take action for improvement are:

- Log book/log sheet have not constructed the proper set of standard form and put in essential topic to be included in the system. Such as Safety/Environment, Abnormal condition, Maintenance complete, Maintenance on going and Plant status Especially Shift Sup/LTO are needed.
- Writing skill of Team operators need to be improved on how to carry out the message pass through other shift. Need to put details of essential topic.
- Log sheet of Team operators only put in tiny detail and no explanation

Suggestion from team operator, English lesson should be taken for them, especially English writing skill so they would be able to communicate in English when making shift report and write in the log sheet

4.12 Summary

Implementing Shift Handover Audit at Case study company by implementing auditing and shift operating staff by 4 shifts which are: Shift A/B/C/D in total of 2 times by having committee who auditor by 8 persons check though each area of designate of working area that have been response to.

The result from the audit found that the working practices during shift handover have some best practice and some need to be improved.

Need to improve on certain topic:

- No standard procedure to be follows for effective shift handover.
- Log book/log sheet has not designated the important topic and concern issue that essentially need to shift handover.

- For team operator, the description in the log was not in details and cannot convey the message to the incoming operator to get clear point of view to understand the message or activity to be continue in the next shift.

Best practices are:

- For shift supervisor and Lead team operator have prepared the precise details for shift handover including detail for operator who has been absence for long period to understand the history and previous work and present also refer to daily, weekly operation plan to give clear instruction for the next shift including drawing of the outstanding maintenance activity and process instrument diagram for the team.
- Face-to-face and two way communication have been conduct during shift handover.
- Shift handover meeting have been conduct before commencing their task, so that makes team member feel more comfortable and getting confident about their works in area of response and also cross checking one another for better understanding of their task and highlight activity have been stated.
- There is one hour for conduct shift handover which is sufficient for the detail for the next shift to continue their work effectively.

4.13 Action plan

Audit Team suggested that in prior to conduct standard effective shift handover according to the objective. Therefore, Good Practice in their system should be remaining and other items need to close the loop for development according to Audit Team suggestion.

In order to improve on the effectiveness and the action plan had been show as table below for the illustration.

Improving Item	How to do	Plan date	Completion	
			Yes	No
1 Create work instruction procedure for operator to be following in effective shift handover.	Constructed Work Instruction to covered and follow the requirement	1/8/08	Issued 14/8/08	
2 Constructed the content of Shift handover Log sheet by discussed and consult with Shift sup/LTO to be agree d.	Constructed Log sheet by divided into 3 set for <ul style="list-style-type: none"> • Shift sup/LTO • Board man • Field operators 	4-6 /8/08	Issued 12/8/08	
3 Conduct training session to operators about effective shift handover with manual to be study.	Conduct training session to operators about effective shift handover with manual to be study. For Day shift operator team about 2 hours. It has been conduct by Job Instructors	28 July Shift " B" 30 July Shift "C" 1 Aug Shift "D" 4 Aug Shift "A"	Done as planned	

Table 4.5: Shows action plan for implement