

CHAPTER 6

CONCLUSION AND RECOMMENDATION

6.1 Conclusion

The purpose of this thesis is to study the using of the modified failure mode and effect analysis in the energy conservation activity in a lube base oil refinery. In order to apply the FMEA technique for the energy conservation purpose, the criteria of the severity, occurrence and detection must be modified and agreed by the working team.

From the working team's brainstorming, 11 potential failure modes have been identified as following.

- No. 1) VDU Heater's efficiency is low
- No. 2) HOU Heater's efficiency is low
- No.3) Excess stripping steam in sour water stripping unit (SWS)
- No.4) Failure of steam traps
- No.5) One side of the dewaxing filters does not need lighting all the time.
- No.6) The compressed air from the bitumen-blowing units' compressor is excess and always blown to atmosphere.
- No.7) The compressed air from the instrument air compressor is excess and always blown to atmosphere.
- No.8) The temperature of cooling water supply is lower than designed value.
- No.9) The temperature outlet of AFC is controlled by using by-pass valve.
- No.10) MP steam is letdown to LP steam with the rate of 4 - 5 TPH constantly.
- No.11) Too low product run down temperature

When risk priority number (RPN) is calculated, the first five failure modes that are most risky are considered to take the actions to reduce the RPN. But because the plant was shut down due to financial problem, only 2 actions have been taken and the result is shown below.

1) *No. 5: Modify separation lighting switch at dewaxing filter*

The RPN is reduced from 280 to 28

2) **No. 6: Bitumen blowing units' common air line modification**

The RPN is reduced from 120 to 2

Although the remaining actions to solve the three failure modes have not been implemented, but from the result of two actions already done shows the significantly reducing of RPN. With this technique, the energy loss point of all process areas can be analyzed by working team and the action plans to solve the points of energy loss can be prioritized and managed effectively. So, it can be implied that the result of the actions to be implemented will also be satisfied and this modified technique can be adapted to use in the energy conservation purpose.

In order to measure the result of the implementation, Energy intensity index (EII) is another indicator that can be used to measure the utilization of energy used in refinery. From the calculation result of EII, for the potential failure mode No.5, the EII is improved but the main effect is not come from the implementation of the action because the energy reduced from the action is just only 0.2% of total energy consumed by the unit. For potential failure mode No. 6, the energy reduced from the implementation of the action is around 30% of the total energy consumed by the process, so, the EII value is significantly reduced from the implementation of the action. Because the EII is concerned with the process utilization and total energy consumed by the process the effects such as process shut down or rate of running through put can also effect to the value measurement. So,

further study is needed to investigate the real effect of the actions on the EII value.

Another benefit of the system implementation is this activity can make the concerning people especially for operation department technicians to have the willingness about the energy conservation attitude that is the most important advantage result because the system can not be succeeded without people awareness.

However, some limitations found during implementation are discussed in the next section.

6.2 Limitation of the technique

- 6.2.1 The modified criteria of severity, occurrence and detection is suitable for only the lube base oil refinery in this thesis and can not be used without modification for other oil refinery or other industries because each plant has its own design technology and different capacity with others. Then, a serious problem of one oil refinery may not be a serious problem for another oil refinery.
- 6.2.2 The weighting of severity, occurrence and detection ranking are the same. In some cases that the RPN are the same, it may lead to confuse to prioritize the actions needed to be done or make wrong decision.
- 6.2.3 Although the severity, occurrence and detection criteria are considered, but in the real situation, the feasibility of the action that needs modification and investment is another criteria that has to be considered.

6.3 Recommendation for the technique

- 6.3.1 In order to apply this technique to other oil refineries or other industries, the criteria of severity, occurrence and detection must be standardized. In order to standardize these criteria, the factors needed to adjust plant's capacity and technology must be considered.

- 6.3.2 The modification on weighting of severity, occurrence and detection should be implemented in order to support the decision making in actions to be done.
- 6.3.3 The criteria about the feasibility of the actions to be implemented, especially on the financial aspect and difficulty of the implementation, must be added in order to support the decision making about the action to be done and avoid the loss of time to study.

6.4 Recommendation for further study

After the plant is started up, the remaining actions should be implemented and the result indicators both RPN and EII should be calculated and analyzed in order to know the problems from the technique implementation and improve for the better solution.