The strength analysis on structures that imposed to cyclic load is needed to ensure the integrity of the structure and for assessing possible damage due to fatigue. This final project discusses the risk analysis on the mooring line due to the SPM's structure fatigue load. The Analysis used software ORCAFLEX for modelling to get a tension which is then used to calculate the damage. Hence, the fatigue life of each mooring line against each direction of loading tankers to the mooring could be determined. After the damage is known then we proceeded to calculate its reliability based on fatigue-based failure modes to determine the probability of failure on the structure of SPM mooring line experiencing fatigue load which exceeds the total cumulative fatigue damage. The maximum probability of failure on the mooring inline condition is in the third chain with 0.008 probability, while for the condition betweenline greatest probability of failure is in the third chain that is equal to 0.005 probability. The level of risk on the mooring line is low, only the third chain on the inline condition that have higher risk level than the others, the risk level is at ALARP region which is an area where the minimum threshold of the risk is acceptable.

Key words: SPM, Mooring line, Risk, Inline, Between line, Total Cumulative Fatigue Damage.