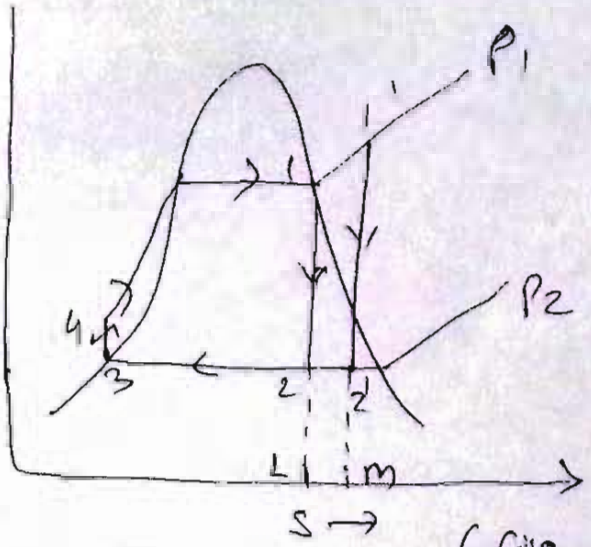
Topic → Effect of Temp & Pressure on Rankine cycle →

[A] - Effect of Super Heat →

Rankine cycle 1-2-3-4-1 and 1'-2'-3-4-1' using dry saturated and superheated steam respectively are shown in fig 1. From above two cycles, it is clear that superheat cycles delivers more work and the excess work is represented by area 1-1'2'-2-1. But it also takes in more heat and this heat is represented by area 1-1'-m-L-1. The result is that the efficiency of Rankine cycle using superheated steam is more than that of the dry saturated steam. Due to the superheating of steam the average temp of heat addition to the cycle increases, so there should be an increase in the thermal efficiency compared to cycle using dry saturated steam



(fig-1)

(B) - Effect of Maxm Pressure →

In fig 2; two cycles 1-2-3-4-1 and 1'-2'-3'-4'-1' have the same maxm Temp $T_1' = T_1$ but different maxm Pressures $P_1' > P_1$. The Condenser Pressure (P_2) is the same for both case. Therefore, it is clear from the fig, that due to increase in maxm Press. from Pressure P_1 to P_1' the net work increases by the area shown by horizontal lines of hatching and decrease by the area shown by the cross hatchings.

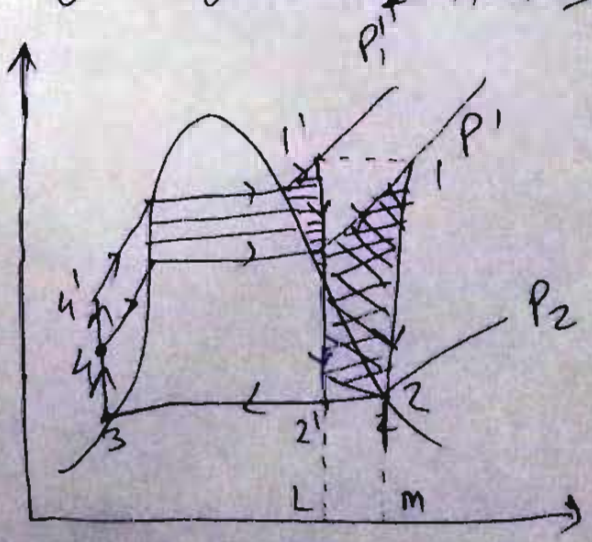
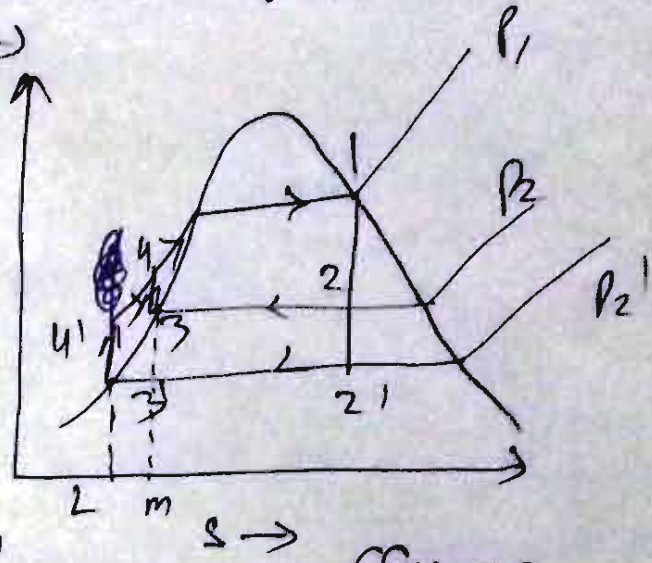


fig - 2

So the net work is nearly same. but the heat rejected decreased by the area 2-2'-1-m. Since the heat rejection is reduced in case of increasing max^m Press; so thermal efficiency also increases. Therefore by increasing max^m pressure, the thermal efficiency of Rankine cycle increased.

(c) Effect of Exhaust Pressure →

fig-3 shows two cycles 1-2-3-4-1 and 1-2'-3'-4'-1. these cycles have same max^m Press. (P_1) and Temp^r (T_1) but different exhaust Pressure $P_2 < P_2'$.



(fig-3)

It is clear from fig that if the exhaust pressure is reduced from P_2 to P_2', the net work is increased by area 2-2'-3'-4-3-2, and the heat supplied to the steam increased by the area 1-3'-4'-4-m-1. On Actual diagram these two areas are nearly equal, so net result is an increase in the cycle thermal efficiency.