Part A

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| Table 1: P\_Boiler=16500, P\_Condenser=10 | | | | |  |  |  |
| **T Super-Heated** | **565.6** | **580** | **600** | **621.1** |  |  |  |
| Qboiler | 1429000 | 1422000 | 1411000 | 1400000 |  |  |  |
| Qcondenser | 879300 | 871627 | 861144 | 850290 |  |  |  |
| Wturbine | 556165 | 556060 | 555919 | 555778 |  |  |  |
| ηcycle | 0.3848 | 0.3869 | 0.3898 | 0.3928 |  |  |  |
| XTO | 0.8414 | 0.8486 | 0.8582 | 0.8681 |  |  |  |
| Table 2: T\_sh=568.6, P\_Condensor=10 | | | | |  | **Units** | |
| **P Boiler** | **16500** | **20000** | **22000** | **241000** |  | Pressure (P) | kPa |
| Qboiler | 1428000 | 1441000 | 1404000 | 1397000 |  | Energy/Work | kJ/s |
| Qcondenser | 877692 | 860892 | 853541 | 847177 |  | Temp (T\_sh) | Degree C |
| Wturbine | 556143 | 557441 | 558195 | 559000 |  |  |  |
| ηcycle | 0.3852 | 0.3898 | 0.3919 | 0.3937 |  |  |  |
| XTO | 0.8429 | 0.8268 | 0.8184 | 0.81 |  |  |  |
| Table 3: P\_Boiler=17000, T\_sh=602 | | | | |  |  |  |
| **P Condenser** | **10** | **8** | **7** | **5** |  |  |  |
| Qboiler | 1407000 | 1390000 | 1381000 | 1357000 |  |  |  |
| Qcondenser | 857335 | 840330 | 830566 | 807229 |  |  |  |
| Wturbine | 556081 | 555965 | 555900 | 555744 |  |  |  |
| ηcycle | 0.3908 | 0.3956 | 0.3984 | 0.4052 |  |  |  |
| XTO | 0.8569 | 0.851 | 0.8476 | 0.8392 |  |  |  |

Recommendation:

* From the table 1, we can see that as the temperature of the steam increases

1. the efficiency increases slightly.
2. The energy input to boiler decreases
3. The turbine work and the condenser energy output both degreases.
4. The quality of the mixture at the turbine increases

This path will not archive exactly the 1% increases in efficiency even with a top temperature of the steam. It also might not be applicable depending of the boiler and the turbine specification. At very high temperature the turbine blade could melt, and the boiler could might no be able to supply the necessary heat. And if it does, we can also be worry about the pip that will carry the steam to the turbine.

* From the table 2, we can see that as pressure in the boiler increase

1. the efficiency increases by little over 1 percentile.
2. The energy input to boiler decreases drastically
3. The turbine work and the condenser energy output both decreases.
4. The quality of the mixture at the turbine decreases

Increasing the pressure inside the boiler that maximum the max level to get the 1% increase in efficiency could be hazardous due to an explosion of the equipment. It could be impossible to reach that pressure as the pump specification.

* From the table 2, we can see that as the pressure of the condenser decreases

1. the efficiency increases by little over 1 percentile just after 2 points decrease in the condenser pressure.
2. The energy input to boiler decreases drastically
3. The turbine works output decrease slightly and the condenser energy output decreases.
4. The quality of the mixture at the turbine decreases

This solution could be the best option. A slight increase in the pump pressure (boiler) by 500 kPa and decreasing the condenser pressure by only 2 points. As the pressure and temperature dependent, we can play with temperature of the condenser together with pressure to get this desired value. The cooling water temperature could play into this.

Part B

**10–30C:** During reheating

Pump work input Remains the same

Turbine Work Output Increases

Heat Supplied Increases

Heat rejected Increases

Moisture Content at turbine exit decreases5

**10–42C:** During regeneration

Turbine Work Output decreases

Heat Supplied Decreases

Heat rejected Decreases

Moisture Content at turbine remain the same