An investigation for air pollutants gases is conducted. The emitted hazards gases investigated was (unburned hydrocarbon, carbon monoxide, soot, carbon dioxide, and nitric oxides). And these gases were investigated due to their sever effects on human health. The emissions were investigated are those which produced from combusting two types of fuels at the same time. The burner used to reach this goal was a dual fuel burner which is designed and manufactured locally. The aim was to decrease the concentrations of these gases and making an optimization between them with a mixture consists of two types of fuels to be burned at the same time. And also an optimization for equivalence ratio and atomization pressure is made. And last optimization for cooling exhaust effect is made.

The investigation is made for five thermal loads to be considered locally in our markets. The fuels were used in combusting process are consist of two type, Gas-oil fuel and Iraqi liquefied petroleum gas (LPG).

In order to investigate these hazards emitted gases a test rig which is manufactured in local market is used. The test rig is consists of the following parts:

1- Air blower to provide controlled air stream to the combustion.

2- Gas-oil fuel supplied system.

3- LPG providing system.

4- Dual fuel burner.

5- Inline water cooled heat exchanger.

6- Gas-analyzer to investigate for (UHC, CO%, CO_2%, and NO_x).

7- Smoke meter, which is used to investigate for soot.

The investigation plan includes the following steps:

1- Considering five different values for equivalence ratio starting from (0.6 to 1.4) with step of (0.2).

2- Using different percentage of the thermal load by LPG to be participated for each thermal load that mentioned before as (10%, 15%, 20%, and 25%).

3- Cooling the combustion products with water heat exchanger to reduce the emissions.

The results showed the influence of mentioned parameters in reducing the emission concentrations, the results was as follows:

1- The increasing in equivalence ratio is caused in increasing the concentrations of (UHC, CO%, and Soot %). While its caused in decreasing the concentration of (NOx, and CO_2). And the best equivalence ratio to be considered is (0.8). The optimization of equivalence ratio is made for pure Gas-oil only.

For the first thermal load as an example, at the equivalence ratio of (0.8) increasing of emissions noticed for (UHC) by (26.1) ppm, (CO % (volume)) by (0.013), and (Soot %) by (6.92%). And (NOx) decreased by (7.72) ppm, and (CO_2%) also decreased by (0.132 % (volume)) these results if compared with point of (0.8) equivalence ratio.

2- When adding LPG% of the thermal loads from (10% to 25%), with considering equivalence ratio at (0.8). The results showed decreasing in (UHC) by (24.3) ppm. (CO %) by (2.62% (volume)), and (Soot %) by (5.82%), in the other hand the emissions of (NOx) increased by (15) ppm, and (CO_2%) increased by (2 % (volume)). These results was for thermal load of (44.02) kW. And the best mixture with LPG and Gas-oil was (20% LPG+80% gas-oil)

3- For The thermal load of (44.02) kW, the results of exhaust cooling effect caused in increasing in the following emission of (UHC) by (45.14) ppm, (CO %) by (0.031%), and (Soot %) by (2.64%), while (NOx), and (CO_2) decreased by (14.06) ppm and (4.24% (volume)) respectively.

4- The atomization pressure increasing from 3 to7) bars results in in decreasing in sauter mean diameter from ((132.2μm) to (95.5μm) and this results in increasing in (NOx), (CO_2%) emissions and decreasing in (UHC, CO%, And Soot%) and this can be noticed from the figs (4.86) to (4.90).