We claim:

1. A fuel control system (300) for fuel consumption calculation for a fuel and water mixture, the fuel control system (300) comprising:

a mixer (330);

a fuel source (310) fluidly coupled to the mixer (330), the fuel source (310) being configured to measure a flow of fuel to the mixer (330);

a water source (315) fluidly coupled to the mixer (330), the water source (315) being configured to measure a flow of water to the mixer (330);

a mixture flow meter (5) fluidly coupled to the mixer (330), the mixture flow meter (5) being configured to receive and measure properties of a fuel/water mixture from the mixer (330); and

a controller (360) communicatively coupled to the fuel source (310), the water source (315), and the mixture flow meter (5), said controller (360) being configured to calculate a fuel consumption based on the measured flow of the fuel and the measured flow of the water.

2. The fuel control system (300) of claim 1, wherein the controller (360) being configured to calculate the fuel consumption based on the measured flow of the fuel and the measured flow of the water comprises the controller (360) being configured to calculate the fuel consumption based on equation:

$$SFOC = \left[\frac{\alpha}{K} * Be * \frac{Q_{TEST}}{Q_{CONT}}\right] - EDP,$$

where:

SFOC = specific fuel oil consumption (g/kWh);

Q_{TEST} = net calorific value of the fuel oil during test (MJ/kg);

Q_{CONT} = net calorific value of the fuel oil during the engine's baseline characterization (MJ/kg), which may be referred to as factory acceptance test;

α = power adjustment factor;

K = ratio of indicated power;

Be = fuel oil consumption on test bed (g/kWh); and

EDP = Engine driven pumps (g/kWh).

3. The fuel control system (300) of claim 2, wherein the net calorific content of the fuel during test (Q_{TEST}) is updated using the following equation:

$$Q_{NEW} = (Q_{FUEL} * m_{FUEL}) + (Q_{WATER} * m_{WATER});$$

where:

Q_{NEW} = calorific content of the fuel/water mixture;

Q_{FUEL} = calorific content value of fuel oil;

Q_{WATER} = calorific content value of water;

m_{FUEL} = mass flow concentration factor of fuel; and

m_{WATER} = mass flow concentration factor of water.

4. The fuel control system (300) of claim 1, wherein the controller (360) being configured to calculate the fuel consumption based on the measured flow of the fuel and the water comprises the controller (360) being configured to calculate a mass flow concentration factor of the fuel (m_{FUEL}) and a mass flow concentration factor of the water (m_{WATER}) based on the measured flow of the fuel, the measured flow of the water, and a measured flow of the fuel/water mixture provided by the mixture flow meter (5).

5. The fuel control system (300) of one of any of the foregoing claims 1 through 4, wherein the water source (315) comprises a water source flow meter (5w) and the fuel source (310) comprises a fuel source flow meter (5f).

6. The fuel control system (300) of one of any of the foregoing claims 1 through 5, wherein the water source (315) being configured to measure the flow of water comprises the water source (315) being configured to measure a mass flow of the water ($m_{FLOW\ WATER}$) and the fuel source (310) being configured to measure the flow of the fuel comprises the fuel source (310) being configured to measure a mass flow of fuel ($m_{FLOW\ FUEL}$).

7. The fuel control system (300) of one of any of the foregoing claims 1 through 6, wherein the mixture flow meter (5) being configured to receive and measure properties of a fuel/water mixture from the mixer (330) comprises the mixture flow meter (5) being configured to measure a mass flow of the fuel/water mixture ($m_{FLOW\ TOTAL}$).

8. The fuel control system (300) of one of any of the foregoing claims 1 through 7, wherein the measured flow of the fuel and the measured flow of the water are volume flow rates, and wherein the fuel source (310) is further configured to measure a density of the flow of the fuel, the water source (315) is further configured to measure a density of the flow of the water, and the properties of the fuel/water mixture comprise at least one of a volume flow rate and a density of the fuel/water mixture.

9. A method of calculating a fuel consumption of a fuel and water mixture, the method comprising:

flowing a fuel/water mixture;

measuring a flow of the fuel/water mixture;

measuring a flow of the fuel and a flow of the water in the fuel/water mixture; and

calculating a fuel consumption based on the measured flow of the fuel, the measure flow of the water, and the measured flow of the fuel/water mixture.

10. The method of claim 9, wherein calculating the fuel consumption based on the measured flow of the fuel and the water comprises calculating the fuel consumption based on equation:

$$SFOC = \left[\frac{\alpha}{K} * Be * \frac{Q_{TEST}}{Q_{CONT}}\right] - EDP,$$

where:

$SFOC$ = specific fuel oil consumption (g/kWh);

Q_{TEST} = net calorific value of the fuel oil during test (MJ/kg);

Q_{CONT} = net calorific value of the fuel oil during the engine's baseline characterization (MJ/kg), which may be referred to as factory acceptance test;

α = power adjustment factor;

K = ratio of indicated power;

Be = fuel oil consumption on test bed (g/kWh); and

EDP = Engine driven pumps (g/kWh).

11. The method of claim 10, wherein the net calorific content of the fuel during test (Q_{TEST}) is updated using the following equation:

$$Q_{NEW} = (Q_{FUEL} * m_{FUEL}) + (Q_{WATER} * m_{WATER});$$

where:

Q_{NEW} = calorific content of the fuel/water mixture;

Q_{FUEL} = calorific content value of fuel oil;

Q_{WATER} = calorific content value of water;

m_{FUEL} = mass flow concentration factor of fuel; and

m_{WATER} = mass flow concentration factor of water.

12. The method of one of any of the foregoing claims 9 through 11, wherein calculating a fuel consumption based on the measured flow of the fuel and the water comprises calculating a mass flow concentration factor of the fuel (m_{FUEL}) and a mass flow concentration factor of the water (m_{WATER}) based on the measured flow of the fuel and the water, and a measured flow of the fuel/water mixture.

13. The method of one of any of the foregoing claims 9 through 12, wherein measuring the flow of the fuel and the water comprises measuring a mass flow of the water ($m_{FLOW\ WATER}$) and measuring a mass flow of fuel ($m_{FLOW\ FUEL}$).

14. The method of one of any of the foregoing claims 9 through 13, wherein measuring the flow rate of the fuel and the water comprises measuring a mass flow of the fuel/water mixture ($m_{FLOW\ TOTAL}$).

15. The method of one of any of the foregoing claims 9 through 14, wherein the measured flow of the fuel and the measured flow of the water are volume flow rates, and wherein the method further comprises measuring a density of at least one of the flow of the fuel and the flow of the water.