CLAIMS

1. A system for evaluating a sample of a residual oil feedstock and calculating coke, gas, and distillate yields, coke sulfur and metals content, and ranking of coke type that could be derived from the residual oil feedstock if it were to be subjected to delayed coking, without first performing delayed coking, the system comprising:

a non-volatile memory device that stores calculation modules and data, the data including a feedstock sulfur content (F_{Sulfur}), a feedstock metals content (F_{Metals}), and a carbon residue value of the feedstock sample, where the carbon residue value is selected from one of a Conradson carbon residue value (CCR) or a micro carbon residue value;

a processor coupled to the non-volatile memory;

the non-volatile memory device including a computer readable program code embodied therein as said calculation modules, the computer readable program code adapted to be executed by the processor coupled to the memory to implement a method for calculating the coke, gas, and distillate yields, the coke sulfur and metals content, and the ranking of coke type that could be derived from the residual oil feedstock, the method comprising:

retrieving the carbon residue value from the non-volatile memory, calculating the coke yield (Y_{Coke}) as a function of the carbon residue value, and storing the coke yield into the non-volatile memory;

retrieving the carbon residue value from the non-volatile memory, calculating the gas yield (Y_G) as a function of the carbon residue value, and storing the gas yield into the non-volatile memory;

retrieving the carbon residue value from the non-volatile memory, calculating naphtha yield (Y_N) as a function of the carbon residue value, and storing the naphtha yield into the non-volatile memory;

retrieving the coke yield, gas yield, and naphtha yield from the non-volatile memory, calculating light coker gas oil yield (Y_{LCGO}) as a function of the coke yield, gas yield, and naphtha yield, and storing the light coker gas oil yield into the non-volatile memory;

retrieving the coke yield, gas yield, naphtha yield, and light coker gas oil yield from the non-volatile memory, calculating heavy coker gas oil yield (Y_{HCGO}) as a function of the

coke yield, gas yield, naphtha yield, and light coker gas oil yield, and storing the heavy coker gas oil yield into the non-volatile memory;

retrieving the feedstock sulfur content from the non-volatile memory, calculating the coke sulfur content (C_{Sulfur}) as a function of the feedstock sulfur content, and storing the coke sulfur content into the non-volatile memory; and

retrieving the feedstock metals content and the coke yield from the non-volatile memory, calculating the coke metal content (C_{Metals}) as a function of the feedstock metals content and the coke yield, and storing the coke metal content into the non-volatile memory;

ranking the coke type as suitable for anode if $C_{Metals} < 650$ ppmw and $C_{Sulfur} < 3.5$ W %, and otherwise ranking the coke type as only suitable for fuel, and storing the ranking into the non-volatile memory.

2. The system of claim 1, wherein the carbon value is the micro carbon residue value, and the residual oil feedstock sample contains a micro carbon residue value in the range of 0.01-50 W %, a sulfur level in the range of 0.01-10 W %, and a metals level in the range of 0.01-2000 ppmw.

3. The system of claim 1, wherein:

Calculating the coke yield (Y_{coke}) as a function of the carbon residue value uses equation $Y_{coke} = 1.6 *$ carbon residue value;

Calculating the gas yield (Y_G) as a function of the carbon residue value uses equation $Y_G = 0.144 *$ carbon residue value + 7.8;

Calculating the naphtha yield (Y_N) as a function of the carbon residue value uses equation $Y_N = 0.343 *$ carbon residue value + 11.29;

Calculating the light coker gas oil (Y_{LCGO}) as a function of the coke yield, gas yield, and naphtha yield uses equation $Y_{LCGO} = (100 - Y_{COKE} - Y_G - Y_N) * (-0.02273 * Y_{Coke}^2 + 1.193357 * Y_{Coke} + 45.37)/100$;

Calculating the heavy coker gas oil yield (Y_{HCGO}) as a function of the coke yield, naphtha yield, and light coker gas oil yield uses equation $Y_{HCGO} = 100 - Y_{coke} - Y_G - Y_N - Y_{LCGO}$;

Calculating the coke sulfur content (C_{sulfur}) as a function of the feedstock sulfur content uses equation $C_{sulfur} = 1.4 * F_{Sulfur} + 0.18$; and

Calculating the coke metal content (C_{Metals}) as a function of the feedstock metals content and the coke yield uses equation $C_{Metals} = 100 * F_{Metals} / Y_{Coke}$.

4. A method for evaluating a sample of a residual oil feedstock and calculating coke, gas, and distillate yields, coke sulfur and metals content, and ranking of coke type that could be derived from the residual oil feedstock if it were to be subjected to delayed coking, without first performing delayed coking, the method comprising:

providing a computer comprising a processor coupled to a non-volatile memory, wherein the non-volatile memory stores calculation modules and data, the data including a feedstock sulfur content (F_{Sulfur}), a feedstock metals content (F_{Metals}), and a carbon residue value of the feedstock sample, where the carbon residue sample is selected from one of a Conradson carbon residue value (CCR) or a micro carbon residue value;

using the processor to retrieve the carbon residue value from the non-volatile memory, to calculate the coke yield (Y_{Coke}) as a function of the carbon residue value, and to store the coke yield into the non-volatile memory;

using the processor to retrieve the carbon residue value from the non-volatile memory, to calculate the gas yield (Y_G) as a function of the carbon residue value, and to store the gas yield into the non-volatile memory;

using the processor to retrieve the carbon residue value from the non-volatile memory, to calculate naphtha yield (Y_N) as a function of the carbon residue value, and to store the naphtha yield into the non-volatile memory;

using the processor to retrieve the coke yield, gas yield, and naphtha yield from the non-volatile memory, to calculate light coker gas oil yield (Y_{LCBO}) as a function of the coke yield, gas yield, and naphtha yield, and to store the light coker gas oil yield into the non-volatile memory; and

using the processor to retrieve the coke yield, gas yield, naphtha yield, and light coker gas oil yield from the non-volatile memory, to calculate heavy coker gas oil yield (Y_{HCGO}) as a function of the coke yield, gas yield, naphtha yield, and light coker gas oil yield, and to store the heavy coker gas oil yield into the non-volatile memory;

using the processor to retrieve the feedstock sulfur content from the non-volatile memory, to calculate the coke sulfur content (C_{Sulfur}) as a function of the feedstock sulfur content, and to store the coke sulfur content into the non-volatile memory;

using the processor to retrieve the feedstock metals content and the coke yield from the non-volatile memory, to calculate the coke metal content (C_{Metals}) as a function of the feedstock metals content and the coke yield, and to store the coke metal content into the non-volatile memory; and

determining the ranking of the coke type as suitable for anode if $C_{Metals} < 650$ ppmw and $C_{Sulfur} < 3.5$ W %, while otherwise determining the ranking of the coke type as only suitable for fuel, and storing the ranking into the non-volatile memory.

5. The method of claim 4, wherein the carbon value is the micro carbon residue value, and the residual oil feedstock sample contains a micro carbon residue value in the range of 0.01-50 W %, a sulfur level in the range of 0.01-10 W %, and a metals level in the range of 0.01-2000 ppmw.

6. The method of claim 4, wherein:

$Y_{coke} = 1.6 *$ carbon residue value;

$Y_G = 0.144 *$ carbon residue value + 7.8;

$Y_N = 0.343 *$ carbon residue value + 11.29;

$Y_{LCGO} = (100 - Y_{Coke} - Y_G - Y_N) * (-0.02273 * Y_{Coke}^2 + 1.193357 * Y_{Coke} + 45.37)/100$;

$Y_{HCGO} = 100 - Y_{Coke} - Y_G - Y_N - Y_{LCGO}$;

$C_{Sulfur} = 1.4 * F_{Sulfur} + 0.18$; and

$C_{Metals} = 100 * F_{Metals} / Y_{Coke}$.