Class clsPVTGas

Initial production GOR corrected to separator conditions (Rollins-McCain)

```
Function FctRsPbCor(GORp As Double, SpegO As Double, SpegG As Double, Psep As Double,
                    Tsep As Double) As Double
      Input:        GORp   Initial production GOR (m3/m3)
                    SpegO  Oil gravity (non-dimensional)
                    SpegG  Gas gravity (non-dimensional)
                    Psep   Separator pressure (bar)
                    Tsep   Separator temperature (°C)
      Return:       Corrected production GOR (m3/m3); 0 - No solution
```

Gas compresibility factor (Standing-Katz method)

```
Function FctZ_Stand(Pr As Double, Tr As Double, GamaG As Double) As Double
      Input:        Pr     Pressure (bar)
                    Tr     Temperature (°C)
                    GamaG  Gas gravity (non-dimensional)
      Return:       Gas compresibility factor (non-dimensional); 0 - No solution
```

Gas compresibility factor (Brill-Beggs method)

```
Function FctZ_BB(Pr As Double, Tr As Double, Ppc As Double, Tpc As Double) As Double
      Input:        Pr     Pressure (bar)
                    Tr     Temperature (°C)
                    Ppc    Pseudo critical pressure (bar)
                    Tpc    Pseudo critical temperature (°C)
      Return:       Gas compresibility factor (non-dimensional); 0 - No solution
```

Gas compresibility factor (Hall-Yarborough method)

```
Function FctZ_HY(Pr As Double, Tr As Double, Ppc As Double, Tpc As Double) As Double
      Input:        Pr     Pressure (bar)
                    Tr     Temperature (°C)
                    Ppc    Pseudo critical pressure (bar)
                    Tpc    Pseudo critical temperature (°C)
      Return:       Gas compresibility factor (non-dimensional); 0 - No solution
```

Gas viscosity (mPas) - Gas composition is unknown

```
Function FctVisG(Tr As Double, Pr As Double, GamaG As Double) As Double
      Input:        Tr     Temperature (°C)
                    Pr     Pressure (bar)
                    GamaG  Gas gravity
      Return:       Gas viscosity (mPas); 0 - No solution
```

Gas viscosity (with correction for acid gases N2, CO2 and H2S)

```
Function FctVisGcor(Tr As Double, Pr As Double, GamaG As Double, Ppc As Double,
                    Tpc As Double,N2cor As Double, CO2cor As Double, H2Scor As Double) As Double
      Input:        Tr     Temperature (°C)
                    Pr     Pressure (bar)
                    GamaG  Gas gravity (non-dimensional)
                    Ppc    Pseudo critical pressure (bar)
                    Tpc    Pseudo critical temperature (°C)
                    N2cor  N2 corrected (non-dimensional)
                    CO2cor CO2 corrected (non-dimensional)
                    H2Scor H2S corrected (non-dimensional)
      Return:       Gas viscosity (mPas); 0 - No solution
```

Gas formation volume factor

```
Function FctBg(Tr As Double, Pr As Double, Z As Double) As Double
       Input:       Tr     Temperature (°C)
                    Pr     Pressure (bar)
                    Z      Gas compresibility (non-dimensional)
       Return:      Gas formation volume factor (m3/m3); 0 - No solution
```

Gas density

```
Function FctDenG(Tr As Double, Pr As Double, Z As Double, GamaG As Double) As Double
       Input:       Tr     Temperature (°C)
                    Pr     Pressure (bar)
                    Z      Gas compresibility factor (non-dimensional)
                    GamaG  Gas gravity (non-dimensional)
       Return:      Gas density(kg/m3); 0 - No solution
       Remarks:     Gas composition is unknown
```

Pseudo critical pressure

```
Function FctPpc(GamaG As Double) As Double
       Input:       GamaG  Gas gravity (non-dimensional)
       Return:      Pseudo critical pressure; 0 - No solution
```

Pseudo critical temperature

```
Function FctTpc(GamaG As Double) As Double
       Input:       GamaG  Gas gravity (non-dimensional)
       Return:      Pseudo critical temperature; 0 - No solution
```

Pseudo reduced pressure

```
Function FctPpr(Pr As Double, Ppc As Double) As Double
       Input:       Pr     Pressure (bar)
                    Ppc    Pseudo critical pressure (bar)
       Return:      Pseudo reduced pressure; 0 - No solution
```

Pseudo reduced temperature

```
Function FctTpr(Tr As Double, Tpc As Double) As Double
       Input:       Tr     Temperature (°C)
                    Tpc    Pseudo critical temperature (°C)
       Return:      Pseudo reduced temperature; 0 - No solution
```

Gas molecular weight

```
Function FctMwtG(GamaG As Double) As Double
       Input:       GamaG  Oil gravity (non-dimensional)
       Return:      Gas molecular weight (g/mol); 0 - No solution
```

Condensate molecular weight

```
Function FctMwtC(GamaC As Double) As Double
       Input:       GamaC  Condensate relative density
       Return:      Condensate molecular weight (g/mol); 0 - No solution
```

Class clsPVTOil

Oil molecular weight

```
Function FctMwtO(GamaO As Double) As Double
       Input:       GamaO  Oil gravity (non-dimensional)
       Return:      Oil molecular weight (g/mol); 0 - No solution
```

Bubble-point pressure (Standing method) (1)

```
Function FctPrPb_Stand(Tr As Double, GamaO As Double, RsPbCor As Double,
                       GamaG As Double) As Double
       Input:       Tr     Temperature (°C)
                    GamaO  Oil gravity (non-dimensional)
                    RsPbCor Initial production GOR corrected to separator conditions (m3/m3)
                    GamaG  Gas gravity (non-dimensional)
       Return:      Bubble-point pressure (bar); 0 - No solution
```

Bubble-point pressure (Vasquez-Beggs method) (2)

```
Function FctPrPb_VasBegg(Tr As Double, GamaO As Double, RsPbCor As Double,GamaG As Double,
                         Tsep As Double, Psep As Double) As Double
       Input:       Tr     Temperature (°C)
                    GamaO  Oil gravity (non-dimensional)
                    RsPbCor Initial production GOR corrected to separator conditions (m3/m3)
                    GamaG  Gas gravity (non-dimensional)
                    Tsep   Separator temperature (°C)
                    Psep   Separator pressure (bar)
       Return:      Bubble-point pressure (bar); 0 - No solution
```

Bubble-point pressure (Glaso method) (3)

```
Function FctPrPb_Glaso(Tr As Double, GamaO As Double, RsPbCor As Double,
                       GamaG As Double) As Double
       Input:       Tr     Temperature (°C)
                    GamaO  Oil gravity (non-dimensional)
                    RsPbCor Initial production GOR corrected to separator conditions (m3/m3)
                    GamaG  Gas gravity (non-dimensional)
       Return:      Bubble-point pressure (bar); 0 - No solution
```

Bubble-point pressure (MECO method) (4)

```
Function FctPrPb_Meco(Tr As Double, GamaO As Double, RsPbCor As Double,
                      GamaG As Double) As Double
       Input:       Tr     Temperature (°C)
                    GamaO  Oil gravity (non-dimensional)
                    RsPbCor Initial production GOR corrected to separator conditions (m3/m3)
                    GamaG  Gas gravity (non-dimensional)
       Return:      Bubble-point pressure (bar); 0 - No solution
```

Bubble-point pressure (Kartoatmadjo-Schmidt method) (5)

```
Function FctPrPb_KartoSchm(Tr As Double, GamaO As Double, RsPbCor As Double, GamaG As Double,
                           Tsep As Double, Psep As Double) As Double
       Input:       Tr     Temperature (°C)
                    GamaO  Oil gravity (non-dimensional)
                    RsPbCor Initial production GOR corrected to separator conditions (m3/m3)
                    GamaG  Gas gravity (non-dimensional)
                    Tsep   Separator temperature (°C)
                    Psep   Separator pressure (bar)
       Return:      Bubble-point pressure (bar); 0 - No solution
```

Bubble-point pressure (Petrosky-Farshad method) (6)

```
Function FctPrPb_PetroFar(Tr As Double, GamaO As Double, RsPbCor As Double,
                          GamaG As Double) As Double
      Input:       Tr     Temperature (°C)
                   GamaO  Oil gravity (non-dimensional)
                   RsPbCor Initial production GOR corrected to separator conditions (m3/m3)
                   GamaG  Gas gravity (non-dimensional)
      Return:      Bubble-point pressure (bar); 0 - No solution
```

Bubble-point pressure (Lasater method) (7)

```
Function FctPrPb_Lasater(Tr As Double, GamaO As Double, RsPb As Double, GamaG As Double,
                         MwtO As Double) As Double
      Input:       Tr     Temperature (°C)
                   GamaO  Oil gravity (non-dimensional)
                   RsPb   Solution gas at bubble-point pressure (m3/m3)
                   GamaG  Gas gravity (non-dimensional)
                   MwtO   Oil molecular weight (g/mol)
      Return:      Bubble-point pressure (bar); 0 - No solution
```

Solution gas (Standing method) (1)

```
Function FctRs_Stand(Tr As Double, Pr As Double, GamaO As Double, GamaG As Double,
                     Pb As Double) As Double
      Input:       Tr     Temperature (°C)
                   Pr     Pressure (bar)
                   GamaO  Oil gravity (non-dimensional)
                   GamaG  Gas gravity (non-dimensional)
                   Pb     Bubble-point pressure (bar)
      Return:      Solution gas (m3/m3); 0 - No solution
```

Solution gas (Vasquez-Beggs method) (2)

```
Function FctRs_VasBegg(Tr As Double, Pr As Double, GamaO As Double, GamaG As Double,
                       Pb As Double) As Double
      Input:       Tr     Temperature (°C)
                   Pr     Pressure (bar)
                   GamaO  Oil gravity (non-dimensional)
                   GamaG  Gas gravity (non-dimensional)
                   Pb     Bubble-point pressure (bar)
      Return:      Solution gas (m3/m3); 0 - No solution
```

Solution gas (Glaso method) (3)

```
Function FctRs_Glaso(Tr As Double, Pr As Double, GamaO As Double, GamaG As Double,
                     Pb As Double) As Double
      Input:       Tr     Temperature (°C)
                   Pr     Pressure (bar)
                   GamaO  Oil gravity (non-dimensional)
                   GamaG  Gas gravity (non-dimensional)
                   Pb     Bubble-point pressure (bar)
      Return:      Solution gas (m3/m3); 0 - No solution
```

Solution gas (MECO method) (4)

```
Function FctRs_MECO(Tr As Double, Pr As Double, GamaO As Double, GamaG As Double,
                    Pb As Double) As Double
      Input:       Tr     Temperature (°C)
                   Pr     Pressure (bar)
                   GamaO  Oil gravity (non-dimensional)
                   GamaG  Gas gravity (non-dimensional)
                   Pb     Bubble-point pressure (bar)
      Return:      Solution gas (m3/m3); 0 - No solution
```

Solution gas (Kartoatmadjo-Schmidt method) (5)

```
Function FctRs_KartoSchm(Tr As Double, Pr As Double, GamaO As Double, GamaG As Double,
                         Pb As Double, Tsep As Double, Psep As Double) As Double
      Input:       Tr     Temperature (°C)
                   Pr     Pressure (bar)
                   GamaO  Oil gravity (non-dimensional)
                   GamaG  Gas gravity (non-dimensional)
                   Pb     Bubble-point pressure (bar)
                   Tsep   Separator temperature (°C)
                   Psep   Separator pressure (bar)
      Return:      Solution gas (m3/m3); 0 - No solution
```

Solution gas (Petrosky-Farshad method) (6)

```
Function FctRs_PetroFar(Tr As Double, Pr As Double, GamaO As Double, GamaG As Double,
                        Pb As Double) As Double
      Input:       Tr     Temperature (°C)
                   Pr     Pressure (bar)
                   GamaO  Oil gravity (non-dimensional)
                   GamaG  Gas gravity (non-dimensional)
                   Pb     Bubble-point pressure (bar)
      Return:      Solution gas (m3/m3); 0 - No solution
```

Solution gas (Lasater method) (7)

```
Function FctRs_Lasater(Tr As Double, Pr As Double, GamaO As Double, GamaG As Double,
                       MwtO As Double, Pb As Double) As Double
      Input:       Tr     Temperature (°C)
                   Pr     Pressure (bar)
                   GamaO  Oil gravity (non-dimensional)
                   GamaG  Gas gravity (non-dimensional)
                   MwtO   Oil molecular weight (g/mol)
                   Pb     Bubble-point pressure (bar)
      Return:      Solution gas (m3/m3); 0 - No solution
```

Dead oil viscosity (Beggs-Robinson method) (1)

```
Function FctVisOd_BeggRob(Tr As Double, GamaO As Double) As Double
      Input:       Tr     Temperature (°C)
                   GamaO  Oil gravity (non-dimensional)
      Return:      Dead oil viscosity (mPas); 0 - No solution
```

Dead oil voscosity (Beal method) (2)

```
Function FctVisOd_Beal(Tr As Double, GamaO As Double) As Double
      Input:       Tr     Temperature (°C)
                   GamaO  Oil gravity (non-dimensional)
      Return:      Dead oil viscosity (mPas); 0 - No solution
```

Oil voscosity (Beggs-Robinson method) (1)

```
Function FctVisO_BeggRob(Pr As Double, Pb As Double, Rs As Double, RsPb As Double,
                         VisOd As Double) As Double
      Input:       Pr     Pressure (bar)
                   Pb     Bubble-point pressure (bar)
                   Rs     Solution gas (m3/m3)
                   RsPb   Solution gas at bubble-point pressure (m3/m3)
                   VisOd  Dead oil viscosity (mPas)
      Return:      Oil viscosity (mPas); 0 - No solution
```

Oil viscosity (Chew-Connaly method) (2)

```
Function FctVisO_ChewCon(Rs As Double, VisOd As Double) As Double
      Input:       Rs     Solution gas (m3/m3)
                   VisOd  Dead oil viscosity (mPas)
      Return:      Oil viscosity (mPas); 0 - No solution
```

Oil isothermal compressibility

```
Function FctCmpO(Tr As Double, Pr As Double, Rs As Double, GamaO As Double,
                 GamaG As Double) As Double
      Input:       Tr     Temperature (°C)
                   Pr     Pressure (bar)
                   Rs     Solution gas (m3/m3)
                   GamaO  Oil gravity (non-dimensional)
                   GamaG  Gas gravity (non-dimensional)
      Return:      Oil isothermal compressibility (1/bar); 0.00001 - In case of an error
```

Oil formation volume factor (Standing method) (1)

```
Function FctBo_Stand(Pr As Double, Pb As Double, Tr As Double, GamaO As Double,
                     GamaG As Double) As Double
      Input:       Pr     Pressure (bar)
                   Pb     Bubblepoint pressure (bar)
                   Tr     Temperature (°C)
                   GamaO  Oil gravity (non-dimensional)
                   GamaG  Gas gravity (non-dimensional)
      Return:      Oil formation volume factor (m3/m3); 0 - No solution
```

Oil formation volume factor (Vasquez-Beggs method) (2)

```
Function FctBo_VasBegg(Pr As Double, Pb As Double, Tr As Double, GamaO As Double,
                       GamaG As Double) As Double
      Input:       Pr     Pressure (bar)
                   Pb     Bubblepoint pressure (bar)
                   Tr     Temperature (°C)
                   GamaO  Oil gravity (non-dimensional)
            GamaG  Gas gravity (non-dimensional)
      Return:      Oil formation volume factor (m3/m3); 0 - No solution
```

Oil formation volume factor (Glaso method) (3)

```
Function fctBo_Glaso(Pr As Double, Pb As Double, Tr As Double, GamaO As Double,
                     GamaG As Double) As Double
      Input:       Pr     Pressure (bar)
                   Pb     Bubblepoint pressure (bar)
                   Tr     Temperature (°C)
                   GamaO  Oil gravity (non-dimensional)
                   GamaG  Gas gravity (non-dimensional)
      Return:      Oil formation volume factor (m3/m3); 0 - No solution
```

Oil formation volume factor (MECO method) (4)

```
Function FctBo_MECO(Pr As Double, Pb As Double, Tr As Double, GamaO As Double,
                    GamaG As Double) As Double
       Input: Pr      Pressure (bar)
              Pb      Bubblepoint pressure (bar)
              Tr      Temperature (°C)
              GamaO   Oil gravity (non-dimensional)
              GamaG   Gas gravity (non-dimensional)
       Return:       Oil formation volume factor (m3/m3); 0 - No solution
```

Oil formation volume factor (Kartoatmadjo-Schmidt method) (5)

```
Function FctBo_KartoSchm(Pr As Double, Pb As Double, Tr As Double, GamaO As Double,
                         GamaG As Double, Tsep As Double, Psep As Double) As Double
       Input:        Pr     Pressure (bar)
                     Pb     Bubblepoint pressure (bar)
                     Tr     Temperature (°C)
                     GamaO  Oil gravity (non-dimensional)
                     GamaG  Gas gravity (non-dimensional)
                     Tsep   Separator temperature (°C)
                     Psep   Separator pressure (bar)
       Return:       Oil formation volume factor (m3/m3); 0 - No solution
```

Oil formation volume factor (Petrosky-Farshad method) (6)

```
Function FctBo_PetroFar(Pr As Double, Pb As Double, Tr As Double, GamaO As Double,
                        GamaG As Double) As Double
       Input:        Pr     Pressure (bar)
                     Pb     Bubblepoint pressure (bar)
                     Tr     Temperature (°C)
                     GamaO  Oil gravity (non-dimensional)
                     GamaG  Gas gravity (non-dimensional)
       Return:       Oil formation volume factor (m3/m3); 0 - No solution
```

Oil density

```
Function FctDenO(Pr As Double, Pb As Double, GamaO As Double, GamaG As Double, Rs As Double,
                 RsPb As Double, Bo As Double, BoPb As Double, Co As Double) As Double
       Input:        Pr     Pressure (bar)
                     Pb     Bubble-point pressure (bar)
                     GamaO  Oil gravity (non-dimensional)
                     GamaG  Gas gravity (non-dimensional)
                     Rs     Solution gas (m3/m3)
                     RsPb   Solution gas at bubble-point pressure (m3/m3)
                     Bo     Oil formation volume factor (m3/m3)
                     BoPb   Oil formation volume factor at bubble-point pressure (m3/m3)
                     Co     Oil isothermal compressibility (1/bar)
       Return:       Oil density (kg/m3); 0 - No solution
```

Gas/Oil interfacial tension)

```
Function FctSigmaO(MwtO As Double, DenO As Double, DenG As Double) As Double
       Input: MwtO   Oil molecular weight (g/mol)
              DenO   Oil density (kg/m3)
              DenG   Gas density (kg/m3)
       Return:       Gas/Oil interfacial tension (mN/m); 0 - No solution
```

Total volume factor (General method) (1)

```
Function FctBt_Gen(Tr As Double, Pr As Double, Pb As Double, GamaO As Double, GamaG As Double,
                   Rs As Double, RsPb As Double, Bo As Double, Z As Double) As Double
      Input:       Tr     Temperature (°C)
                   Pr     Pressure (bar)
                   Pb     Bubble-point pressure (bar)
                   GamaO  Oil gravity (non-dimensional)
                   GamaG  Gas gravity (non-dimensional)
                   Rs     Solution gas (m3/m3)
                   RsPb   Solution gas at bubble-point pressure (m3/m3)
                   Bo     Oil formation volume factor (m3/m3)
                   Z      Gas compresibility factor (non-dimensional)
      Return:      Total oil volume factor (m3/m3); 0 - No solution
```

Total volume factor (Glaso method) (2)

```
Function FctBt_Glaso(Tr As Double, Pr As Double, GamaO As Double, GamaG As Double,
                     Rs As Double) As Double
      Input:       Tr     Temperature (°C)
                   Pr     Pressure (bar)
                   GamaO  Oil gravity (non-dimensional)
                   GamaG  Gas gravity (non-dimensional)
                   Rs     Solution gas (m3/m3)
      Return:      Total volume factor (m3/m3); 0 - No solution
```

Total formation volume factor (MECO method) (3)

```
Function fctBt_Meco(Tr As Double, Pr As Double, GamaO As Double, GamaG As Double,
                    Rs As Double) As Double
      Input:       Tr     Temperature (°C)
                   Pr     Pressure (bar)
                   GamaO  Oil gravity (non-dimensional)
                   GamaG  Gas gravity (non-dimensional)
                   Rs     Solution gas (m3/m3)
      Return:      Total oil volume factor (m3/m3); 0 - No solution
```

Class clsPVTWater

Water formation volume factor

```
Function FctBw(Tr As Double, Pr As Double) As Double
       Input:       Tr     Temperature (°C)
                    Pr     Pressure (bar)
       Return:      Water formation volume factor (m3/m3); 0 - No solution
```

Water isothermal compressibility (Brill-Beggs method)

```
Function FctCmpW(Tr As Double, Pr As Double) As Double
       Input:       Tr     Temperature (°C)
                    Pr     Pressure (bar)
       Return:      Water isothermal compressibility (1/bar); 0 - No solution
```

Water density

```
Function FctDenW(Sal As Double) As Double
       Input:       Sal    Water salinity (%)
       Return:      Water density (kg/m3); 0 - No solution
```

Gas/Water interfacial tension

```
Function FctSigmaW(Pr As Double) As Double
       Input:       Pr     Pressure (bar)
       Return:      Gas/Water interfacial tension (mN/m); 0 - No solution
```

Water viscosity

```
Function FctVisW(Tr As Double, Pr As Double, Sal As Double) As Double
       Input:       Tr     Temperature (°C)
                    Pr     Pressure (bar)
                    Sal    Water salinity (%)
       Return: Water viscosity (mPas); 0 - No solution
```