Programm zur Auslegung von Rektifikationkolonnen

Nach dem Öffnen des Files in Excel müssen die Makros aktiviert werden. Sollte das nicht gehen, müssen Sie zuvor Ihre Sicherheits-Einstellung verändern. Dazu gehen Sie auf Extras/Makro/Sicherheit und ändern die Einstellung auf „mittel“. Danach File speichern, schließen und nochmals öffnen. Nun die Makros aktivieren.

```
' these variables are shared by all routines in this module
Dim ANT(3, 5) As Double
Dim VI(5) As Double
Dim PARAM(5, 5) As Double
Dim NK As Integer
Dim NK1 As Integer
Dim NST As Integer
Dim ITEXT As String
Dim ws As Object, wsfp As Object, wsfpd As Object, wsmfd As Object

    Public Sub desw_execute()
'   This program is based on UNIDIST developed in the group
'   of Prof. Aa. Fredenslund at the Technical University of Lyngby in Denmark
'   It was modified for Excel-VBA by Dr. J. Rarey, University of Oldenburg, Germany

'   IMPLICIT REAL*8 (A-H,O-Z)
    Dim P(50) As Double
    Dim XX(5) As Double
    Dim Index(50) As Integer
    Dim PROD(6) As Double
    Dim FEED(6) As Double
    Dim FL(50) As Double
    Dim FV(50) As Double
    Dim FLL(50, 5) As Double
    Dim T(50) As Double
    Dim BMAT(50, 7, 6) As Double
    Dim D(50, 6) As Double
    Dim CM(6, 13) As Double
    Dim Pi(5) As Double
    Dim DPI(5, 6) As Double
    Dim SL(50) As Double
    Dim SV(50) As Double
    Dim FKV(50) As Double
    Dim FSTR(50, 6) As Double

'   get current input sheet and set variables for output sheets
    Set ws = ActiveSheet
    Set wsfp = Sheets("Flux Profile")
    On Error GoTo 21
    Set wsfpd = Sheets("Flux Profile Diagram")
    Set wsmfd = Sheets("Mole Fraction Profile Diagram")
21: On Error GoTo 0
    If Not wsfpd Is Nothing Then wsfpd.Delete
    If Not wsmfd Is Nothing Then wsmfd.Delete

'   Clear Output-Sheets
    wsfp.Cells.ClearContents

'   number of components
    NK = ws.Cells(5, 2)

'   title text
    ITEXT = ws.Cells(6, 2)

'   Wilson parameters  PARAM(I,J) (U(J,I) - U(I,I))
    For i = 1 To NK
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        For N = 1 To NK
            PARAM(i, N) = ws.Cells(17 + i, 1 + N)
        Next N
    Next i

'   molar volumes (CM3/MOL) and Antoine-constants (kPa)
    For i = 1 To NK
        VI(i) = ws.Cells(9 + i, 2)
        For k = 1 To 3
            ANT(k, i) = ws.Cells(9 + i, 2 + k)
        Next k
    Next i

    For i = 1 To NK
        ANT(1, i) = 2.3025851 * ANT(1, i)
        ANT(2, i) = 2.3025851 * ANT(2, i)
    Next i

    NST = ws.Cells(25, 2)
    NFEED = ws.Cells(26, 2)
    NSL = ws.Cells(27, 2)
    NSV = ws.Cells(28, 2)

    Index(1) = 1
    NSL1 = NSL + 1
    NSL2 = NSL + 2
    Index(NSL2 + NSV) = -NST
    IK = 1

'   EINGABE: DESTILLATMENGE, RUECKLAUFVERHAELTNIS, DRUCK IM KOPF UND
'   SUMPF DER KOLONNE (KPA), SCHAETZWERTE FUER DIE TEMPERATUR AM KOPF
'   UND IM SUMPF DER KOLONNE (C)
    DEST = ws.Cells(29, 2)
    RFLX = ws.Cells(30, 2)
    PT = ws.Cells(31, 2)
    PB = ws.Cells(32, 2)
    TT = ws.Cells(33, 2)
    TB = ws.Cells(34, 2)

'   FLMAX: MAXIMALE AENDERUNG DER STROEME (Z.B. 0.5), DTMAX: MAXI-
'   MALE TEMPERATURAENDERUNG WAEHREND DER ITERATION (Z.B. 10.)
    DTMAX = ws.Cells(35, 2)
    FLMAX = ws.Cells(36, 2)

    NK1 = NK + 1
    For i = 1 To NST
        P(i) = PB - (PB - PT) / CDbl(NST - 1) * CDbl(i - 1)
        SL(i) = 0#
        SV(i) = 0#
        FKV(i) = 0#
        FSTR(i, NK1) = 0#
        For j = 1 To NK
            FSTR(i, j) = 0#
        Next j
    Next i
    For i = 1 To NFEED
'       EINGABE DES ZULAUFBODENS, -BEDINGUNGEN UND -MENGEN
'       NF = ZULAUFBODEN
        NF = ws.Cells(39 + i, 2)
'       FKV = DAMPFANTEIL DES ZULAUFS
'       FSTR(NF,I) MENGE DER KOMPONENTE I IM ZULAUF
        FKV(NF) = ws.Cells(39 + i, 3)
        For j = 1 To NK
            FSTR(NF, j) = ws.Cells(39 + i, 3 + j)
        Next j
```

```
        For j = 1 To NK
            FSTR(NF, NK1) = FSTR(NF, NK1) + FSTR(NF, j)
        Next j
    Next i
    If NSL <> 0 Then
       For i = 1 To NSL
'           NLS = BODEN FUER DEN FLUESSIGEN SEITENSTROM
            NLS = ws.Cells(51 + i, 2)
            IK = IK + 1
            Index(IK) = NLS
'           SL = MENGE DES FLUESSIGEM SEITENSTROMS
            SL(NLS) = ws.Cells(51 + i, 3)
        Next i
    End If
    If NSV <> 0 Then
        For i = 1 To NSV
            IK = IK + 1
'           NVS = BODEN FUER DEN DAMPFFOERMIGEN SEITENSTROM
            NVS = ws.Cells(63 + i, 2)
            Index(IK) = -NVS
'           SV = MENGE DES DAMPFFOERMIGEN SEITENSTROMS
            SV(NVS) = ws.Cells(63 + i, 3)
        Next i
    End If
'   BERECHNUNG DER FLUESSIGKEITS- UND DAMPFSTROEME AUF DEN BOEDEN
'   (CONSTANT MOLAL OVERFLOW)
    FV(NST) = DEST + FKV(NST) * FSTR(NST, NK1)
    FL(NST) = DEST * RFLX + (1# - FKV(NST)) * FSTR(NST, NK1) - SL(NST)
    FV(NST - 1) = FL(NST) - FSTR(NST, NK1) + SV(NST) + SL(NST) + DEST
    For ii = 3 To NST
      If NST > 2 Then
        i = NST + 2 - ii
        FL(i) = FL(i + 1) - SL(i) + (1# - FKV(i)) * FSTR(i, NK1)
        FV(i - 1) = FV(i) + SV(i) - FKV(i) * FSTR(i, NK1)
      End If
    Next ii
    FL(1) = FL(2) - SL(1) + (1# - FKV(1)) * FSTR(1, NK1)
    FL(1) = FL(1) - FV(1)
      For j = 1 To NK1
        FEED(j) = 0#
        For i = 1 To NST
            FEED(j) = FEED(j) + FSTR(i, j)
        Next i
      Next j

'   ERSTE ABSCHAETZUNG DES TEMPERATUR- UND KONZENTRATIONSPROFILS
    For i = 1 To NST
        T(i) = TB + (i - 1) * (TT - TB) / NST
    Next i

'   IRES = EXPONENT FUER DAS ABBRUCHKRITERIUM RLIM= 10.D00**(-IRES)
    IRES = ws.Cells(37, 2)
    rlim = 10# ^ (-IRES)

    For i = 1 To NST
      For j = 1 To NK
          FLL(i, j) = FEED(j) / FEED(NK1) * FL(i)
      Next j
    Next i

    NIT = 0
    res = 10# * rlim
    While res > rlim
      NKA = NK - 1
      NIT = NIT + 1
```

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'     BERECHNUNG DER AKTIVITAETSKOEFFIZIENTEN UND DER ABLEITUNG
'     NACH DER TEMPERATUR UND DER MOLMENGEN
      For i = 1 To NST
        For j = 1 To NK
          XX(j) = FLL(i, j)
        Next j

          FLSUM = FL(i)

          Call WILSON(T(i), XX, Pi, DPI, FLSUM)

          For j = 1 To NK
            For k = 1 To NKA
                BMAT(i, j, k) = (DPI(j, k) - DPI(j, NK)) / P(i)
            Next k
            BMAT(i, j, NK) = DPI(j, NK + 1) / P(i)
            BMAT(i, NK + 1, j) = Pi(j) / P(i)
          Next j
      Next i
'200  CONTINUE

      For IK = 1 To NST
        i = NST + 1 - IK
        ip = 2 * NK + 1
        If i = 1 Then ip = NK + 1
        D(i, NK) = -1 + BMAT(i, NK + 1, NK)
        For j = 1 To NKA
          D(i, NK) = D(i, NK) + BMAT(i, NK + 1, j)
          D(i, j) = FSTR(i, j) - FLL(i, j) * (1 + SL(i) / FL(i))
          D(i, j) = D(i, j) - BMAT(i, NK1, j) * (FV(i) + SV(i))
          If i <> 1 Then D(i, j) = D(i, j) + BMAT(i - 1, NK1, j) * FV(i - 1)
          If i <> NST Then D(i, j) = D(i, j) + FLL(i + 1, j)
'         AUFSTELLEN DER JACOBI-MATRIX UND LOESUNG DER TRIDIAGONALEN
'         MATRIX DURCH GAUSSSCHE ELIMINIERUNG
          For k = 1 To NK
            If i <> 1 Then CM(j, k + NK) = BMAT(i - 1, j, k) * FV(i - 1)
            CM(j, k) = -BMAT(i, j, k) * (FV(i) + SV(i))
          Next k
        Next j
        For j = 1 To NKA
            CM(j, j) = CM(j, j) - 1 - SL(i) / FL(i)
        Next j
        For j = 1 To NK
            CM(NK, j) = 0#
            CM(NK, j + NK) = 0#
            CM(j, ip) = D(i, j)
            For k = 1 To NK
                CM(NK, j) = CM(NK, j) + BMAT(i, k, j)
            Next k
        Next j

        If i <> NST Then
            For j = 1 To NKA
                CM(j, ip) = CM(j, ip) - D(i + 1, j)
                For k = 1 To NK
                    CM(j, k) = CM(j, k) - BMAT(i + 1, j, k)
                Next k
            Next j
        End If
        Call GAUSL(6, 13, NK, ip - NK, CM)

        For j = 1 To NK
            D(i, j) = CM(j, ip)
            If i <> 1 Then
            For k = 1 To NK
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```
                BMAT(i, j, k) = CM(j, k + NK)
            Next k
            End If
        Next j

'300   CONTINUE
    Next IK

    For i = 2 To NST
      For j = 1 To NK
        For k = 1 To NK
            D(i, j) = D(i, j) - BMAT(i, j, k) * D(i - 1, k)
        Next k
      Next j
    Next i

    res = 0#
'   AENDERUNG DER UNABHAENGIGEN VARIABLEN NACH DER NEWTON-RAPHSON METHODE
      For i = 1 To NST
        Q = Abs(D(i, NK) / DTMAX)
        If Q > 1# Then D(i, NK) = D(i, NK) / Q
        T(i) = T(i) - D(i, NK)
        D(i, NK) = 0#
        FLM = FLMAX * FL(i)
        For j = 1 To NKA
            D(i, NK) = D(i, NK) - D(i, j)
        Next j
        Sum = 0#
        For j = 1 To NK
            Q = Abs(D(i, j) / FLM)
'           BERECHNUNG DER FEHLERQUADRATSUMME
            res = res + Q * Q
            If Q > 1# Then D(i, j) = D(i, j) / Q
            FLL(i, j) = FLL(i, j) - D(i, j)
            If FLL(i, j) < 0# Then FLL(i, j) = 0#
            Sum = Sum + FLL(i, j)
        Next j
        Q = FL(i) / Sum
        For j = 1 To NK
            FLL(i, j) = FLL(i, j) * Q
        Next j
    Next i
'      WRITE (NAG,502) RES,T(1),T(NST)
'  502 FORMAT(/,' WERT DER ZIELFUNKTION=',E12.3,'   TB =',E12.3,'   TT ='
'     1,E12.3)
'C     UEBERPRUEFUNG DES ABBRUCHKRITERIUMS
Wend

' write flux report column header
wsfp.Cells(1, 1) = "Calculation Output"
wsfp.Cells(3, 1) = "Stage"
wsfp.Cells(3, 2) = "Temperature"
wsfp.Cells(4, 2) = "°C"
wsfp.Cells(3, 3) = "Pressure"
wsfp.Cells(4, 3) = "kPa"
wsfp.Cells(3, 4) = "Total Liquid Flux"
wsfp.Cells(4, 4) = "same as in-unit"
wsfp.Cells(3, 5) = "Component Liquid Flux"
For i = 1 To NK
    wsfp.Cells(4, 4 + i) = "comp. " & i
Next i
wsfp.Cells(3, 5 + NK) = "Component Liquid Mole Fraction"
For i = 1 To NK
    wsfp.Cells(4, 4 + NK + i) = "x" & i
Next i
```

```
' write flux report
For i = 1 To NST
    wsfp.Cells(4 + i, 1) = i
    wsfp.Cells(4 + i, 2) = T(i)
    wsfp.Cells(4 + i, 3) = P(i)
    wsfp.Cells(4 + i, 4) = FL(i)
    Suml = 0
    For j = 1 To NK
        wsfp.Cells(4 + i, 4 + j) = FLL(i, j)
        Suml = Suml + FLL(i, j)
    Next j
    For j = 1 To NK
        wsfp.Cells(4 + i, 4 + NK + j) = FLL(i, j) / Suml
    Next j
Next i

Worksheets("Product Streams").Cells.ClearContents
Worksheets("Product Streams").Cells(1, 1) = "Product Streams"
Worksheets("Product Streams").Cells(3, 1) = "Liquid Product Streams"
Worksheets("Product Streams").Cells(4, 1) = "stage"
Worksheets("Product Streams").Cells(4, 2) = "component streams"

For j = 1 To NSL1
    i = Index(j)
    Q = 1#
    If i <> 1 Then Q = SL(i) / FL(i)
    For k = 1 To NK
        PROD(k) = Q * FLL(i, k)
    Next k
    Worksheets("Product Streams").Cells(4 + j, 1) = i
    For k = 1 To NK
        Worksheets("Product Streams").Cells(4 + j, 1 + k) = PROD(k)
    Next k
Next j

Worksheets("Product Streams").Cells(4 + NSL1 + 2, 1) = "Vapor Product Streams"
Worksheets("Product Streams").Cells(4 + NSL1 + 3, 1) = "stage"
Worksheets("Product Streams").Cells(4 + NSL1 + 3, 2) = "component streams"

NSLT = NSL2 + NSV
lline = 4 + NSL1 + 3
For j = NSL2 To NSLT
    lline = lline + 1
    i = -Index(j)
    Q = 1#
    If i <> NST Then Q = SV(i) / FV(i)
    Worksheets("Product Streams").Cells(lline, 1) = i
    For k = 1 To NK
        PROD(k) = Q * BMAT(i, NK1, k) * FV(i)
        Worksheets("Product Streams").Cells(lline, 1 + k) = PROD(k)
    Next k
Next j
Call format_results
Charts("Flux Profile Diagram").Activate
End Sub

      Sub WILSON(TEMP, FL, Pi, DPI, FLSUM)
'     DAS UNTERPROGRAMM WILSON ERLAUBT DIE BERECHNUNG DER PARTIAL-
'     DRUECKE UND DER ABLEITUNGEN NACH DER TEMPERATUR UND DER MOLMEN
'     GEN ( BASIS: WILSON- UND ANTOINE-GLEICHUNG)
'     DIE UEBERGABEPARAMETER HABEN DIE FOLGENDE BEDEUTUNG:
'     TEMP  TEMPERATUR  C
'     FL(I)  MOLMENGEN DER KOMPONENTE I  I=1,2..NK
'     GAM(I) AKTIVITAETSKOEFFIZIENT BERECHNET MIT DER WILSON-GLEICHUNG
'     PI(I) PARTIALDRUCK DER KOMPONENTE I
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'     DPI(I,J) ABLEITUNG VON PI(I) GENERATED IN WILSON
'     FUER J=1,2..NK SIND ES DIE ABLEITUNGEN NACH DEN MOLMENGEN
'     FUER J=NK+1 SIND ES DIE ABLEITUNGEN NACH DER TEMPERATUR
'     IMPLICIT REAL*8 (A-H,O-Z)
      Dim GAM(5), PRS(5), DPRS(5), WLAM(5, 5)
'!!!!!      COMMON/DIST/ANT(3,5),VI(5),PARAM(5,5),NK,NK1
      For i = 1 To NK
        PRS(i) = Exp(ANT(1, i) - ANT(2, i) / (ANT(3, i) + TEMP))
        DPRS(i) = ANT(2, i) / (ANT(3, i) + TEMP) ^ 2
      Next i
      TEMK = TEMP + 273.15

      For i = 1 To NK
        For j = 1 To NK
            WLAM(i, j) = VI(j) / VI(i) * Exp(-PARAM(i, j) / TEMK)
        Next j
      Next i

      For i = 1 To NK
      A1 = 0#
      A2 = 0#
      A3 = 0#
      A4 = 0#
      For k = 1 To NK
            A5 = 0#
            A6 = 0#
            A1 = A1 + FL(k) * WLAM(i, k)
            A2 = A2 + FL(k) * WLAM(i, k) * PARAM(i, k) / TEMK ^ 2
            For j = 1 To NK
                A5 = A5 + FL(j) * WLAM(k, j)
                A6 = A6 + FL(j) * WLAM(k, j) * PARAM(k, j) / TEMK ^ 2
            Next j
            A3 = A3 + FL(k) * WLAM(k, i) / A5
            A4 = A4 + FL(k) * WLAM(k, i) * PARAM(k, i) / TEMK ^ 2 / A5
            A4 = A4 - FL(k) * WLAM(k, i) * A6 / A5 ^ 2
        Next k
        GAM(i) = Exp(-Log(A1 / FLSUM) + 1# - A3)
        Pi(i) = FL(i) / FLSUM * GAM(i) * PRS(i)
        DPI(i, NK1) = Pi(i) * (-A2 / A1 - A4 + DPRS(i))
        For L = 1 To NK
            A7 = 0#
            A9 = 0#
            For k = 1 To NK
                A8 = 0#
                A9 = A9 + FL(k) * WLAM(L, k)
                For j = 1 To NK
                    A8 = A8 + FL(j) * WLAM(k, j)
                Next j
                A7 = A7 + FL(k) * WLAM(k, i) * WLAM(k, L) / A8 ^ 2
            Next k
            DPI(i, L) = -WLAM(i, L) / A1 - WLAM(L, i) / A9 + A7
        Next L
      Next i

      For i = 1 To NK
        For L = 1 To NK
            S = DPI(i, L) * FL(i)
            If L = i Then S = S + 1
            DPI(i, L) = PRS(i) * GAM(i) / FLSUM * S
        Next L
      Next i
      End Sub
Sub GAUSL(ND, NCOL, N, NS, A)
'    DAS  UNTERPROGRAMM GAUSL LOEST N LINEARE  ALGEBRAISCHE  GLEICHUNGEN
'     DURCH GAUSSSCHE ELIMINIERUNG
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```
'      IMPLICIT REAL*8 (A-H,O-Z)
'ReDim A(ND, NCOL)
N1 = N + 1
NT = N + NS
If N <> 1 Then
    For i = 2 To N
        ip = i - 1
        i1 = ip
        X = Abs(A(i1, i1))
        For j = i To N
          If Abs(A(j, i1)) >= X Then
            X = Abs(A(j, i1))
            ip = j
          End If
        Next j
        If ip <> i1 Then
            For j = i1 To NT
                X = A(i1, j)
                A(i1, j) = A(ip, j)
                A(ip, j) = X
            Next j
        End If
        For j = i To N
            X = A(j, i1) / A(i1, i1)
            For k = i To NT
                A(j, k) = A(j, k) - X * A(i1, k)
            Next k
        Next j
    Next i
End If
    For ip = 1 To N
        i = N1 - ip
        For k = N1 To NT
          A(i, k) = A(i, k) / A(i, i)
          If i <> 1 Then
            i1 = i - 1
            For j = 1 To i1
                A(j, k) = A(j, k) - A(i, k) * A(j, i)
            Next j
          End If
        Next k
    Next ip
End Sub

Private Sub format_results()

' format flux profile report sheet
    Sheets("Flux Profile").Select
    Range("A1").Select
    With Selection.Font
        .Name = "Arial"
        .Size = 16
        .Strikethrough = False
        .Superscript = False
        .Subscript = False
        .OutlineFont = False
        .Shadow = False
        .Underline = xlUnderlineStyleNone
        .ColorIndex = xlAutomatic
    End With
    Selection.Font.Bold = True

    Range("A3:O3").Select
    With Selection.Interior
        .ColorIndex = 34
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        .Pattern = xlSolid
    End With

    Columns("B:B").Select
    Selection.NumberFormat = "0.000"
    Columns("C:C").Select
    Selection.NumberFormat = "0.000"
    Columns("D:D").Select
    Selection.NumberFormat = "0.00"
    Columns("E:O").Select
    Selection.NumberFormat = "0.00000"
    Range("A3:I100").Select

' add chart
    Charts.Add
    Dim ser As Object
    ActiveChart.ChartType = xlXYScatterLines
    On Error Resume Next
    For Each ser In ActiveChart.SeriesCollection
        ser.Delete
    Next ser
    On Error GoTo 0

' select chart data
    undels = ActiveChart.SeriesCollection.Count
    With ActiveChart
        ' Total Flux Curve
        .SeriesCollection.NewSeries
        .SeriesCollection(undels + 1).XValues = "='" & wsfp.Name & "'!R" & CInt(5) & "C1: R"
         & CInt(4 + NST) & "C1 "
        .SeriesCollection(undels + 1).Values = "='" & wsfp.Name & "'!R" & CInt(5) & "C4: R"
         & CInt(4 + NST) & "C4 "
        .SeriesCollection(undels + 1).Name = "='" & wsfp.Name & "'!R3C4"

        ' Component Flux Curves
        For i = 1 To NK
            .SeriesCollection.NewSeries
            .SeriesCollection(undels + 1 + i).XValues = "='" & wsfp.Name & "'!R" & CInt(5) & "C1: R"
             & CInt(4 + NST) & "C1 "
            .SeriesCollection(undels + 1 + i).Values = "='" & wsfp.Name & "'!R" & CInt(5) & "C"
             & CInt(4 + i) & ": R" & CInt(4 + NST) & "C" & CInt(4 + i)
            .SeriesCollection(undels + 1 + i).Name = "='" & wsfp.Name & "'!R4C" & CInt(4 + i)
        Next i
    End With
    ActiveChart.Location Where:=xlLocationAsNewSheet, Name:="Flux Profile Diagram"

    With ActiveChart
        .HasTitle = True
        .ChartTitle.Characters.Text = "Column Profile (Flux)" & Chr(10) & ITEXT
        .Axes(xlCategory, xlPrimary).HasTitle = True
        .Axes(xlCategory, xlPrimary).AxisTitle.Characters.Text = "stage number"
        .Axes(xlValue, xlPrimary).HasTitle = True
        .Axes(xlValue, xlPrimary).AxisTitle.Characters.Text = "flux (input unit)"
    End With
    With ActiveChart.Axes(xlCategory)
        .HasMajorGridlines = True
        .HasMinorGridlines = False
    End With
    With ActiveChart.Axes(xlValue)
        .HasMajorGridlines = True
        .HasMinorGridlines = False
    End With
    ActiveChart.Axes(xlValue).Select
    Selection.TickLabels.NumberFormat = "0.00"
    ActiveChart.ApplyDataLabels Type:=xlDataLabelsShowNone, LegendKey:=False
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```
    With ActiveChart.Axes(xlCategory)
        .MinimumScale = 1
        .MaximumScale = NST
        .MinorUnitIsAuto = True
        .MajorUnitIsAuto = True
        .Crosses = xlAutomatic
        .ReversePlotOrder = False
        .ScaleType = xlLinear
        .DisplayUnit = xlNone
    End With

    For Each ser In ActiveChart.SeriesCollection
        With ser.Border
            .ColorIndex = 57
            .Weight = xlMedium
            .LineStyle = xlContinuous
        End With
    Next ser
    Sheets("Product Streams").Select

' Mole Fraction Profile ----------------------------------------------------------------------------
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' add chart
    Charts.Add
    ActiveChart.ChartType = xlXYScatterLines
    On Error Resume Next
    For Each ser In ActiveChart.SeriesCollection
        ser.Delete
    Next ser
    On Error GoTo 0

' select chart data
    undels = ActiveChart.SeriesCollection.Count
    With ActiveChart

        ' Component mole fraction Curves
        For i = 1 To NK
            .SeriesCollection.NewSeries
            .SeriesCollection(undels + i).XValues = "='" & wsfp.Name & "'!R" & CInt(5) & "C1: R"
             & CInt(4 + NST) & "C1 "
            .SeriesCollection(undels + i).Values = "='" & wsfp.Name & "'!R" & CInt(5) & "C"
             & CInt(4 + NK + i) & ": R" & CInt(4 + NST) & "C" & CInt(4 + NK + i)
            .SeriesCollection(undels + i).Name = "='" & wsfp.Name & "'!R4C" & CInt(4 + NK + i)
        Next i
    End With
    ActiveChart.Location Where:=xlLocationAsNewSheet, Name:="Mole Fraction Profile Diagram"

    With ActiveChart
        .HasTitle = True
        .ChartTitle.Characters.Text = "Column Profile (Mole Fraction)" & Chr(10) & ITEXT
        .Axes(xlCategory, xlPrimary).HasTitle = True
        .Axes(xlCategory, xlPrimary).AxisTitle.Characters.Text = "stage number"
        .Axes(xlValue, xlPrimary).HasTitle = True
        .Axes(xlValue, xlPrimary).AxisTitle.Characters.Text = "mole fraction"
    End With
    With ActiveChart.Axes(xlCategory)
        .HasMajorGridlines = True
        .HasMinorGridlines = False
    End With
    With ActiveChart.Axes(xlValue)
        .HasMajorGridlines = True
        .HasMinorGridlines = False
    End With
    ActiveChart.Axes(xlValue).Select
```

```
    Selection.TickLabels.NumberFormat = "0.00"
    ActiveChart.ApplyDataLabels Type:=xlDataLabelsShowNone, LegendKey:=False

    With ActiveChart.Axes(xlCategory)
        .MinimumScale = 1
        .MaximumScale = NST
        .MinorUnitIsAuto = True
        .MajorUnitIsAuto = True
        .Crosses = xlAutomatic
        .ReversePlotOrder = False
        .ScaleType = xlLinear
        .DisplayUnit = xlNone
    End With
    With ActiveChart.Axes(xlValue)
        .MinimumScale = 0
        .MaximumScale = 1
        .MinorUnitIsAuto = True
        .MajorUnitIsAuto = True
        .Crosses = xlAutomatic
        .ReversePlotOrder = False
        .ScaleType = xlLinear
        .DisplayUnit = xlNone
    End With

    For Each ser In ActiveChart.SeriesCollection
        With ser.Border
            .ColorIndex = 57
            .Weight = xlMedium
            .LineStyle = xlContinuous
        End With
    Next ser

    Sheets("Product Streams").Select
    Range("A1").Select
    With Selection.Font
        .Name = "Arial"
        .Size = 16
        .Strikethrough = False
        .Superscript = False
        .Subscript = False
        .OutlineFont = False
        .Shadow = False
        .Underline = xlUnderlineStyleNone
        .ColorIndex = xlAutomatic
    End With

    Selection.Font.Bold = True
    Range("A3").Select

End Sub

Public Sub desw_prepare_sheets()
'    On Error Resume Next
'    Sheets("Flux Profile").Add
'    Sheets("Product Streams").Add
'    Sheets("desw_in").Add
'    On Error GoTo 0
    Sheets("desw_in").Select
    Cells.Select
    Selection.Clear

    With ws
        .Cells(1, 1) = "Distillation (Naphthali-Sandholm) Using the Wilson-Model"
        .Cells(2, 1) = "based on code given in 'Grundoperationen' (Gmehling, Brehm)"
        .Cells(4, 1) = "General Information"
```

```
        .Cells(5, 1) = "Number of components:"
        .Cells(6, 1) = "Title"
        .Cells(8, 1) = "Pure Component Data"
        .Cells(9, 1) = "Molar volume, Antoine constants (P [kPa] = 10^(A-B/(C+T[°C]))"
        .Cells(9, 2) = "vL"
        .Cells(9, 3) = "A"
        .Cells(9, 4) = "B"
        .Cells(9, 5) = "C"
        .Cells(16, 1) = "Interaction Parameters (Wilson, K)"
        .Cells(17, 2) = "1"
        .Cells(17, 3) = "2"
        .Cells(17, 4) = "3"
        .Cells(17, 5) = "4"
        .Cells(17, 6) = "5"
        .Cells(18, 1) = "1"
        .Cells(19, 1) = "2"
        .Cells(20, 1) = "3"
        .Cells(21, 1) = "4"
        .Cells(22, 1) = "5"
        .Cells(18, 2) = "0"
        .Cells(19, 3) = "0"
        .Cells(20, 4) = "0"
        .Cells(21, 5) = "0"
        .Cells(22, 6) = "0"
        .Cells(24, 1) = "Column Configuration (Stage 1 is the Reboiler)"
        .Cells(25, 1) = "Number of stages (max. 50)"
        .Cells(26, 1) = "Number of feeds"
        .Cells(27, 1) = "Number of liquid side streams"
        .Cells(28, 1) = "Number of vapor side streams"
        .Cells(29, 1) = "Destillate flux"
        .Cells(30, 1) = "Reflux ratio"
        .Cells(31, 1) = "Top pressure (kPa)"
        .Cells(32, 1) = "Button pressure (kPa)"
        .Cells(33, 1) = "Top temperature estimate ( C)"
        .Cells(34, 1) = "Buttom temperature estimate ( C)"
        .Cells(35, 1) = "FLMAX"
        .Cells(36, 1) = "DTMAX"
        .Cells(37, 1) = "Exponent of convergence criterion"
        .Cells(39, 1) = "Feeds"
        .Cells(39, 2) = "stage"
        .Cells(39, 3) = "q"
        .Cells(39, 4) = "n1"
        .Cells(39, 5) = "n2"
        .Cells(39, 6) = "n3"
        .Cells(39, 7) = "n4"
        .Cells(39, 8) = "n5"
        .Cells(40, 1) = "1"
        .Cells(41, 1) = "2"
        .Cells(42, 1) = "3"
        .Cells(43, 1) = "4"
        .Cells(44, 1) = "5"
        .Cells(45, 1) = "6"
        .Cells(46, 1) = "7"
        .Cells(47, 1) = "8"
        .Cells(48, 1) = "9"
        .Cells(49, 1) = "10"
End With
    Range("A1").Select
    With Selection.Font
        .Name = "Arial"
        .Size = 16
        .Strikethrough = False
        .Superscript = False
        .Subscript = False
        .OutlineFont = False
```

```
    .Shadow = False
    .Underline = xlUnderlineStyleNone
    .ColorIndex = xlAutomatic
End With
Selection.Font.Bold = True
Range("A1:F1").Select
With Selection.Interior
    .ColorIndex = 34
    .Pattern = xlSolid
End With
Range("A4:F4").Select
With Selection.Interior
    .ColorIndex = 33
    .Pattern = xlSolid
End With
Range("A8:F8").Select
With Selection.Interior
    .ColorIndex = 33
    .Pattern = xlSolid
End With
Range("A16:F16").Select
With Selection.Interior
    .ColorIndex = 33
    .Pattern = xlSolid
End With
Range("A24:F24").Select
With Selection.Interior
    .ColorIndex = 33
    .Pattern = xlSolid
End With
Range("A39:H39").Select
With Selection.Interior
    .ColorIndex = 33
    .Pattern = xlSolid
End With
Range("A5:A6").Select
With Selection.Interior
    .ColorIndex = 34
    .Pattern = xlSolid
End With
Range("A9:A14").Select
With Selection.Interior
    .ColorIndex = 34
    .Pattern = xlSolid
End With
Range("A17:A22").Select
With Selection.Interior
    .ColorIndex = 34
    .Pattern = xlSolid
End With
Range("B17:F17").Select
With Selection.Interior
    .ColorIndex = 34
    .Pattern = xlSolid
End With
Range("A25:A37").Select
With Selection.Interior
    .ColorIndex = 34
    .Pattern = xlSolid
End With
Range("A40:A49").Select
With Selection.Interior
    .ColorIndex = 34
    .Pattern = xlSolid
End With
```

```
    Range("B18:F22").Select
    Selection.NumberFormat = "0.0000"
    Range("B18").Select
    With Selection.Interior
        .ColorIndex = 34
        .Pattern = xlSolid
    End With
    Range("C19").Select
    With Selection.Interior
        .ColorIndex = 34
        .Pattern = xlSolid
    End With
    Range("D20").Select
    With Selection.Interior
        .ColorIndex = 34
        .Pattern = xlSolid
    End With
    Range("E21").Select
    With Selection.Interior
        .ColorIndex = 34
        .Pattern = xlSolid
    End With
    Range("F22").Select
    With Selection.Interior
        .ColorIndex = 34
        .Pattern = xlSolid
    End With
    ActiveWindow.ScrollRow = 1
    Range("A1:F1").Select
    Selection.Interior.ColorIndex = 37
    Selection.Interior.ColorIndex = 33
    Range("A2").Select
    Selection.Font.Italic = True
    Range("H7").Select
    Columns("A:A").ColumnWidth = 27.89
    Columns("B:I").Select
    With Selection
        .HorizontalAlignment = xlCenter
        .VerticalAlignment = xlBottom
        .WrapText = False
        .Orientation = 0
        .AddIndent = False
        .ShrinkToFit = False
        .MergeCells = False
    End With
    Range("A10").Select
    ActiveCell.FormulaR1C1 = "1"
    Range("A11").Select
    ActiveCell.FormulaR1C1 = "2"
    Range("A12").Select
    ActiveCell.FormulaR1C1 = "3"
    Range("A13").Select
    ActiveCell.FormulaR1C1 = "4"
    Range("A14").Select
    ActiveCell.FormulaR1C1 = "5"
    Range("B15").Select
    ActiveWindow.ScrollRow = 7
End Sub
```