

Anexo

En este apartado se aporta el código Fuente que compone la programación del software, dividido en dos secciones: Formulario 1 y Módulo 1.

Formulario 1

```
Imports System.Web
Imports System.IO
Imports System.Net.Mail
Public Class Form1
    Private archivo As String
    Private temperatura0 As Double
    Private temperatura1 As Double
    Private temperatura2 As Double
    Private temperatura3 As Double
    Private temperatura4 As Double
    Private temperatura5 As Double
    Private b As Integer
    Private pararalarma As Integer
    Dim valor As Object
    Dim email As New MailMessage
    Dim smtp As New SmtplibClient
    Dim mail As System.Net.Mail.MailAddress
    Private caudalac As Double
    Private ultimotiempo
    Private comienzoacum
    Private diftiempo

    Private Sub Button1_Click(sender As Object, e As EventArgs) Handles
Button1.Click
        SerialPort1.PortName = ComboBox1.Text
        FolderBrowserDialog1.ShowDialog()
        If FolderBrowserDialog1.SelectedPath = "" Then Exit Sub
        archivo = FolderBrowserDialog1.SelectedPath & "\" & TextBox5.Text
        If Val(TextBox6.Text) < 1 Then TextBox6.Text = 1

        cambiarsetpoints()
        Timer1.Interval = Int(Val(TextBox6.Text)) * 1000
        Timer1.Enabled = True

        TextBox5.Enabled = False
        TextBox6.Enabled = False
        ComboBox1.Enabled = False
        Button1.Enabled = False
        Button2.Enabled = True
        Button3.Enabled = False
        Button5.Enabled = False
        lectacabada = 1

    End Sub

    Private Sub Button2_Click(sender As Object, e As EventArgs) Handles
Button2.Click
        Timer1.Enabled = False
        Button1.Enabled = True
        Button2.BackColor = Color.Red
        TextBox5.Enabled = True
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        TextBox6.Enabled = True
        ComboBox1.Enabled = True
        Button3.Enabled = True
        Button5.Enabled = True

    End Sub

    Private Sub Button3_Click(sender As Object, e As EventArgs) Handles
Button3.Click

        Button1.Enabled = True
        Button2.Enabled = False
        Button2.BackColor = Color.LightGray
        Button3.Enabled = False

        Me.Chart2.Series("Caudal").Points.Clear()

        Me.Chart3.Series("Presión").Points.Clear()

        Timer1.Enabled = False

        TextBox1.Text = ""
        TextBox2.Text = ""
        TextBox3.Text = ""
        TextBox4.Text = ""
        TextBox12.Text = ""
        TextBox16.Text = ""
        TextBox15.Text = ""
        TextBox17.Text = ""
        TextBox14.Text = ""
        TextBox11.Text = ""
        caudalac = 0
    End Sub

    Private Sub graficar(temperatura1, temperatura2, temperatura3, temperatura4)

        b = b + 1
        Dim a As Double
        a = FormatNumber(Int(Val(TextBox6.Text)) * b / 60, 2)
        Chart2.ChartAreas(0).AxisY.Maximum = 3
        Chart2.ChartAreas(0).AxisY.Minimum = 0
        Chart3.ChartAreas(0).AxisY.Maximum = 600
        Chart3.ChartAreas(0).AxisY.Minimum = 0

        Chart2.Series("Caudal").Points.AddXY(a, temperatura5)

        Chart3.Series("Presión").Points.AddXY(a, temperatura0)

    End Sub

    Private Sub Timer1_Tick(sender As Object, e As EventArgs) Handles Timer1.Tick
        If lectacabada = 1 Then
            lectacabada = 0
            temperatura0 = tempera("00")
            temperatura2 = tempera("02")
            temperatura3 = tempera("03")
            temperatura4 = tempera("04")
            temperatura5 = tempera2() / 100
            If CheckBox1.Checked = True Then
                Dim mensaje
                If temperatura0 < Val(TextBox8.Text) - 10 Then
                    mensaje = "La presión ha bajado demasiado"
                End If
            End If
        End If
    End Sub

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        enviaremail(mensaje)
        enviaremail(mensaje)
        CheckBox1.Checked = False
        My.Computer.Audio.Play(My.Resources.Ring04,
AudioPlayMode.BackgroundLoop)
        ElseIf temperatura0 > Val(TextBox8.Text) + 10 Then
            mensaje = "La presión ha subido demasiado"
            enviaremail(mensaje)
            enviaremail(mensaje)
            CheckBox1.Checked = False
            My.Computer.Audio.Play(My.Resources.Ring04,
AudioPlayMode.BackgroundLoop)
        Else
        End If
        If temperatura5 < Val(TextBox10.Text) - 0.1 Then
            mensaje = "El caudal ha bajado demasiado"
            enviaremail(mensaje)
            enviaremail(mensaje)
            CheckBox1.Checked = False
            My.Computer.Audio.Play(My.Resources.Ring04,
AudioPlayMode.BackgroundLoop)
        ElseIf temperatura5 > Val(TextBox10.Text) + 0.2 Then
            mensaje = "El caudal ha subido demasiado"
            enviaremail(mensaje)
            enviaremail(mensaje)
            CheckBox1.Checked = False
            My.Computer.Audio.Play(My.Resources.Ring04,
AudioPlayMode.BackgroundLoop)
        Else
        End If
    End If

    If comienzoacum = 1 Then ' la primera vez no calculo el acumulado

        diftiempo = Math.Abs(DateDiff(DateInterval.Second, Now,
ultimotiempo))
        If diftiempo < Val(TextBox6.Text) Then diftiempo =
(TextBox6.Text)
        caudalac = caudalac + diftiempo * temperatura5 / 3600
        TextBox11.Text = Format(caudalac, "0.0000")
        ultimotiempo = Now
    Else
        ultimotiempo = Now
        comienzoacum = 1
    End If
End If
guardar(temperatura0, temperatura2, temperatura3, temperatura4, caudalac)
graficar(temperatura0, temperatura2, temperatura3, temperatura4)

TextBox1.Text = temperatura0
TextBox16.Text = temperatura0

TextBox2.Text = temperatura2
TextBox15.Text = temperatura2

TextBox3.Text = temperatura3

TextBox4.Text = temperatura4
TextBox17.Text = temperatura4

TextBox12.Text = temperatura5
TextBox14.Text = temperatura5

```

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    End Sub
    Private Sub guardar(ByVal temperatura As Double, ByVal temperatura2 As
Double, ByVal temperatura3 As Double, ByVal temperatura4 As Double, ByVal cauacu
As Double)
        Dim file As System.IO.StreamWriter
        file = My.Computer.FileSystem.OpenTextFileWriter(archivo & ".txt", True)
        file.WriteLine(Date.Now.ToLongDateString & ";" &
Date.Now.ToLongTimeString & ";" & temperatura & ";" & temperatura2 & ";" &
temperatura3 & ";" & temperatura4 & ";" & temperatura5 & ";" & cauacu)
        file.Close()
    End Sub

    Private Sub Button4_Click(sender As Object, e As EventArgs) Handles
Button4.Click
        SerialPort1.PortName = ComboBox1.Text
        If lectacabada = 1 Then
            lectacabada = 0

            cambiarsetpoints()
            lectacabada = 1
        End If

    End Sub
    Sub enviaremail(mensaje)
        email.From = New MailAddress("controlbenedito@gmail.com")
        email.Subject = mensaje
        email.Body = mensaje
        email.To.Add(TextBox9.Text)
        smtp.EnableSsl = True
        smtp.Port = "587"
        smtp.Host = "smtp.gmail.com"
        smtp.Credentials = New Net.NetworkCredential("controlbenedito@gmail.com",
"upvcontrol")
        smtp.Send(email)
    End Sub
    Private Sub Form1_Load(sender As Object, e As EventArgs) Handles MyBase.Load
        lectacabada = 1
    End Sub

    Private Sub Button5_Click(sender As Object, e As EventArgs) Handles
Button5.Click
        End
    End Sub

    Private Sub Button6_Click(sender As Object, e As EventArgs) Handles
Button6.Click
        My.Computer.Audio.Stop()

    End Sub
End Class

```

Módulo 1

Module Module1

```
Dim TRM As String
Dim uli As String
Dim dummy As String
Dim FCS As VariantType
Dim FLCS As String
Dim dummy As Object
Dim pp As String
Public lectacabada As Integer

Sub cambiarsetpoints()
    'primero cambio el SP de la presión del extractor (unidad 00)
    Dim SPP
    Dim setp
    Dim setpointtext = "@00201"
    Dim completarcar
    Dim numcar
    If Form1.SerialPort1.IsOpen = False Then Form1.SerialPort1.Open()
    Form1.SerialPort1.DiscardInBuffer()
    Form1.SerialPort1.DiscardOutBuffer()

    SPP = Form1.TextBox7.Text
    If Val(SPP) * 10 <= 99 Then
        completarcar = "00"
        numcar = 2
    ElseIf Val(SPP) * 10 <= 999 Then
        completarcar = "0"
        numcar = 3
    Else
        completarcar = ""
        numcar = 4
    End If
    dummy$ = setpointtext & completarcar & Right(Str$(Val(SPP) * 10), numcar)
    FCS = 0
    For I = 1 To Len(dummy$)
        FCS = FCS Xor Asc(Mid$(dummy$, I, 1))
    Next I
    FLCS$ = Right$("0" + Hex$(FCS), 2)
    setp = dummy$ + FLCS$ + "*" + Chr(13)

    Form1.SerialPort1.Write(setp)

    'ahora se cambia el setpoint de la temperatura del baño (unidad 02)
    Dim SPT
    Dim sett
    Dim setpointtext2 = "@02201"
    SPT = Form1.TextBox8.Text
    If Val(SPT) * 10 <= 99 Then
        completarcar = "00"
        numcar = 2
    ElseIf Val(SPT) * 10 <= 999 Then
        completarcar = "0"
        numcar = 3
    Else
        completarcar = ""
        numcar = 4
    End If
    dummy$ = setpointtext2 & completarcar & Right(Str$(Val(SPT) * 10), numcar)
```

```

FCS = 0
For I = 1 To Len(dumy$)
    FCS = FCS Xor Asc(Mid$(dumy$, I, 1))
Next I
FLCS$ = Right$("0" + Hex$(FCS), 2)
sett = dumy$ + FLCS$ + "*" + Chr(13)

Form1.SerialPort1.Write(sett)

Form1.SerialPort1.Close()
'm = 1
End Sub

Function tempera(unidad)
    TRM = "*" + Chr(13)

    uli = "@" + unidad + "1000000"
    dumy = uli
    FCS = 0
    For I = 1 To Len(dumy$)
        FCS = FCS Xor Asc(Mid$(dumy$, I, 1))
    Next I
    FLCS = Right$("0" + Hex$(FCS), 2)
    uli = uli + FLCS + TRM

    If Form1.SerialPort1.IsOpen = False Then Form1.SerialPort1.Open()
    Form1.SerialPort1.DiscardInBuffer()

    Form1.SerialPort1.DiscardOutBuffer()

    Form1.SerialPort1.Write(uli)
    Do
    Loop Until Form1.SerialPort1.BytesToRead >= 15
    pp = Form1.SerialPort1.ReadExisting
    Form1.SerialPort1.Close()

    If Mid$(pp, 9, 1) = "F" Then
        tempera = -Format(Val(Mid$(pp, 10, 3)), "0.0") / 10
    Else
        tempera = Format(Val(Mid$(pp, 10, 4)), "0.0") / 10
    End If

End Function

Function tempera2()
    TRM = Chr(2)

    uli = "050000101800000000001" + Chr(3)
    dumy = uli
    FCS = 0
    For I = 1 To Len(dumy$)
        FCS = FCS Xor Asc(Mid$(dumy$, I, 1))
    Next I
    FLCS = Chr(FCS)
    uli = TRM + uli + FLCS

    If Form1.SerialPort1.IsOpen = False Then Form1.SerialPort1.Open()
    Form1.SerialPort1.DiscardInBuffer()

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```
Form1.SerialPort1.DiscardOutBuffer()  
  
Form1.SerialPort1.Write(uli)  
Do  
Loop Until Form1.SerialPort1.BytesToRead >= 21  
pp = Form1.SerialPort1.ReadExisting  
Form1.SerialPort1.Close()  
  
pp = Mid$(pp, 16, 5)  
tempera2 = Convert.ToInt32(pp, 16) / 10  
  
lectacabada = 1
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```
End Function
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```
End Module
```