



CampusEnergy2021

BRIDGE TO THE FUTURE

Feb. 16-18 | CONNECTING VIRTUALLY

WORKSHOPS | Thermal Distribution: March 2 | Microgrid: March 16





Robert Benz, P.E.

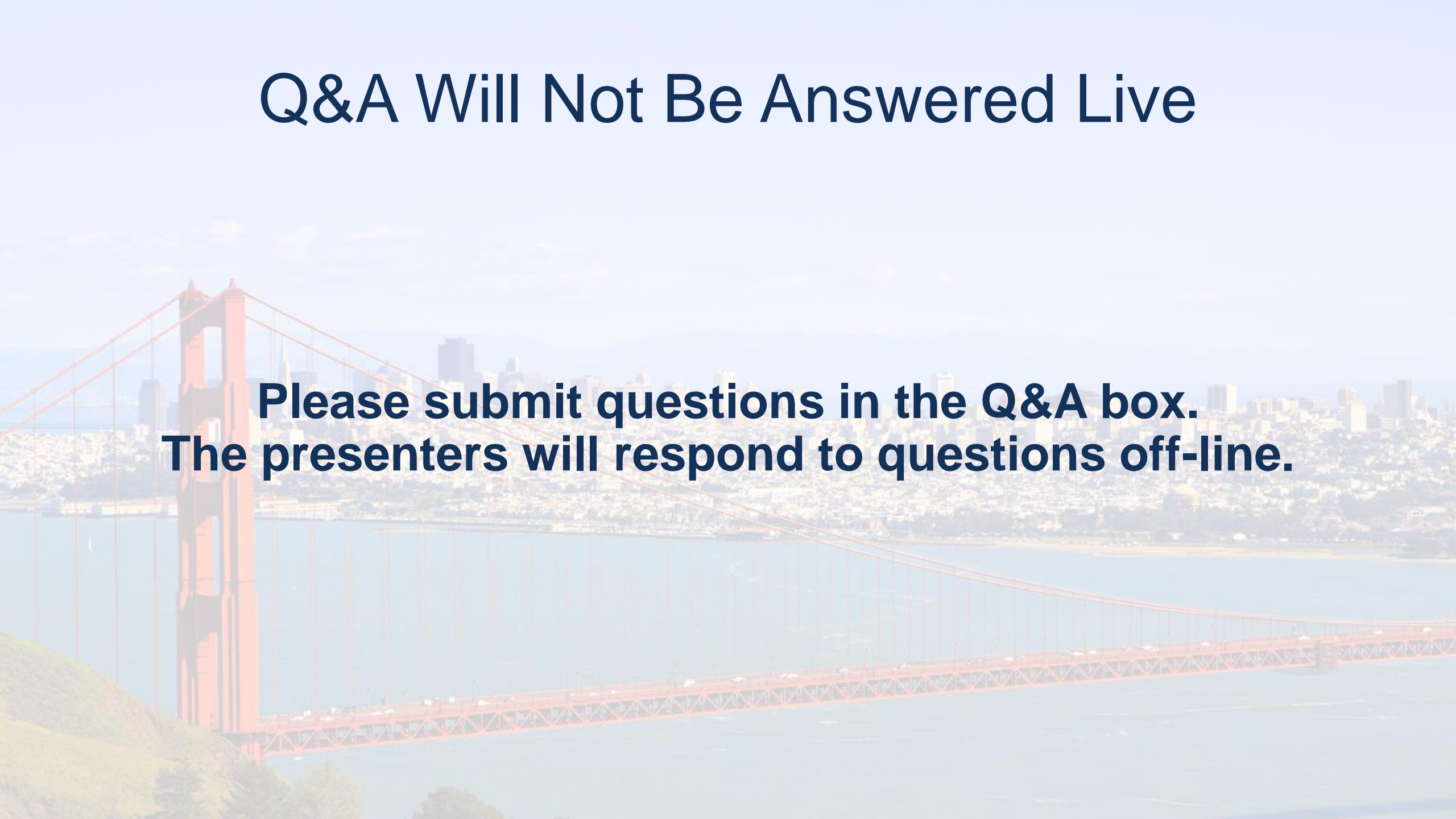
Benz Air Engineering, Co., Inc.


Excel Human Machine Interface




Q&A Will Not Be Answered Live

**Please submit questions in the Q&A box.
The presenters will respond to questions off-line.**






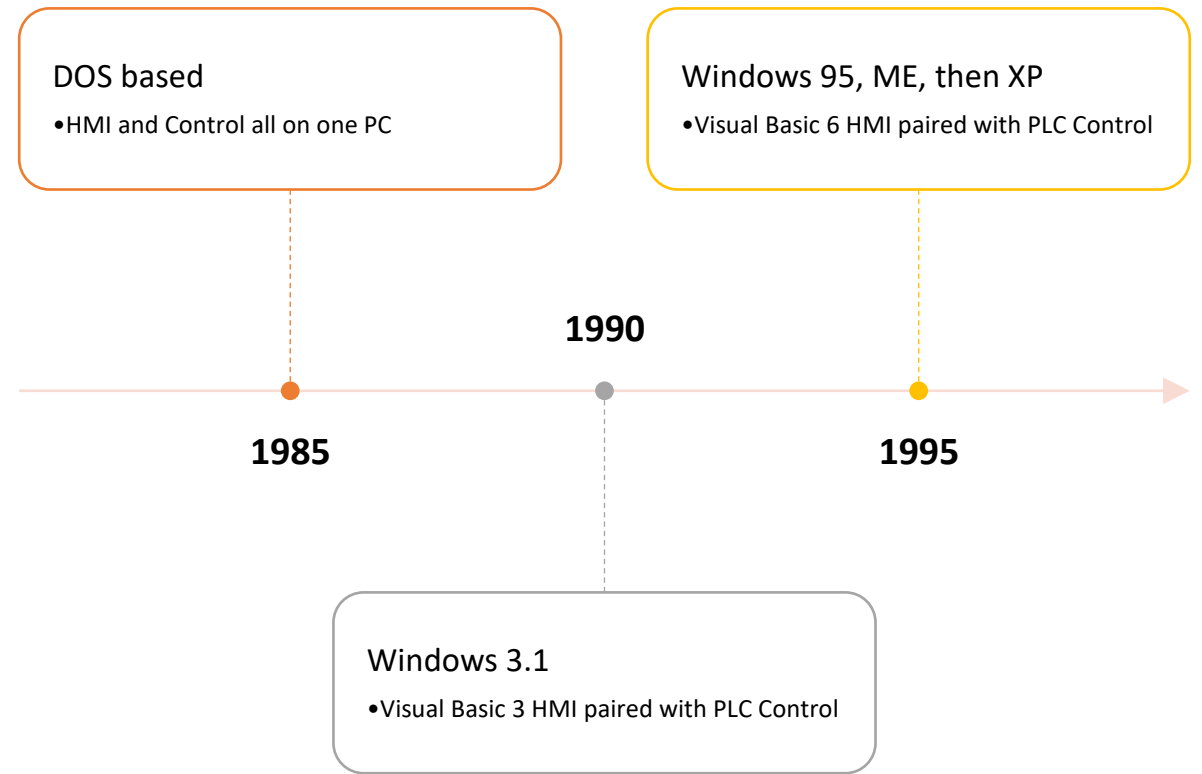
Background The Compu-NOx System



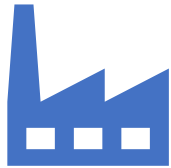
Low NOx Control for Boilers and Heaters

- Lower NOx, Higher Efficiency, ½ the Cost of New Burners
 - Fuel Air and FGR Control using VFDs
 - Dirt Simple, Accurate Control,
 - > 20 to one turndown
- 

Control System



Advantages of VB



Wide use in Industrial and Commercial HMI application



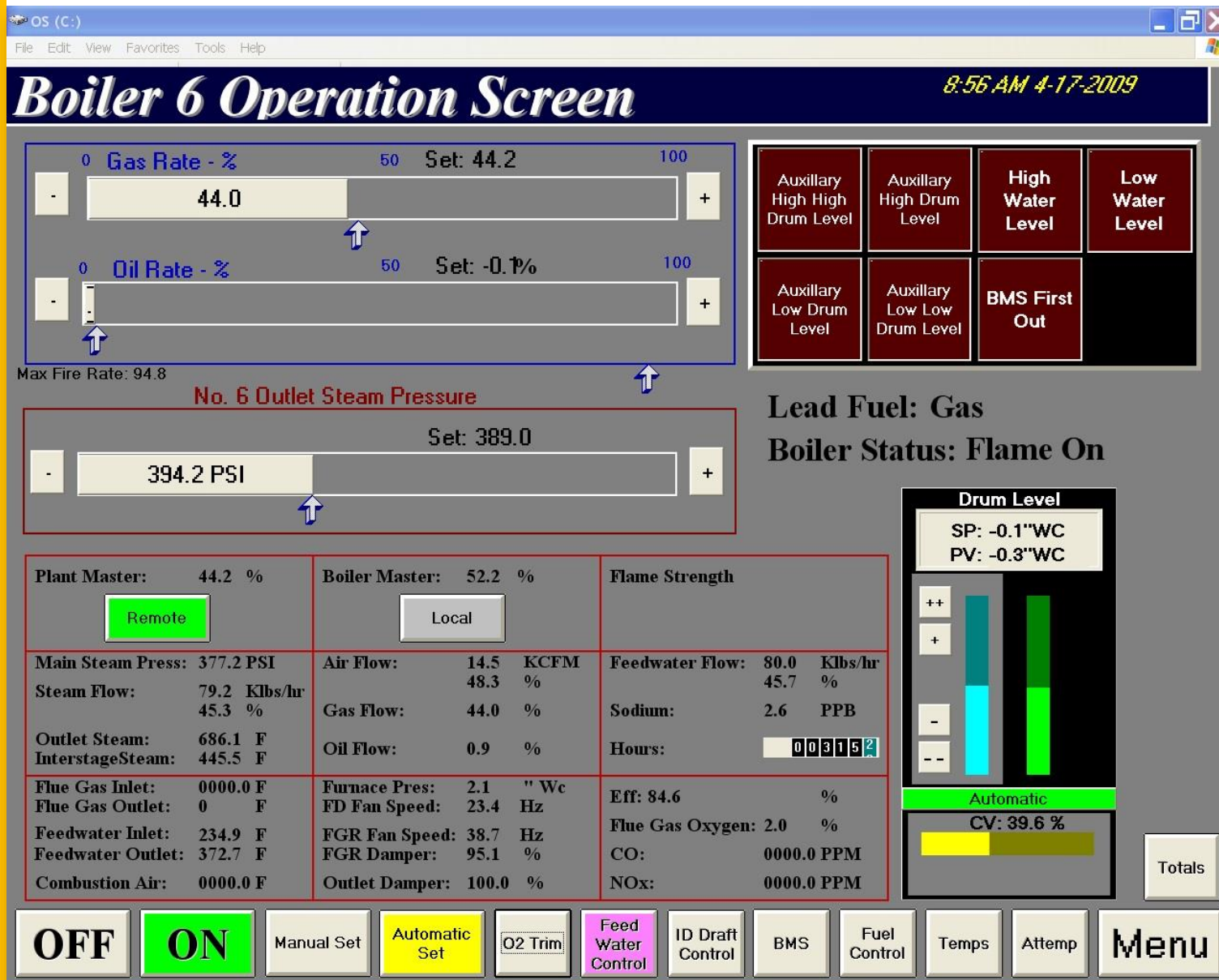
Same version in Office Macros

VBA (Applications) in wide use

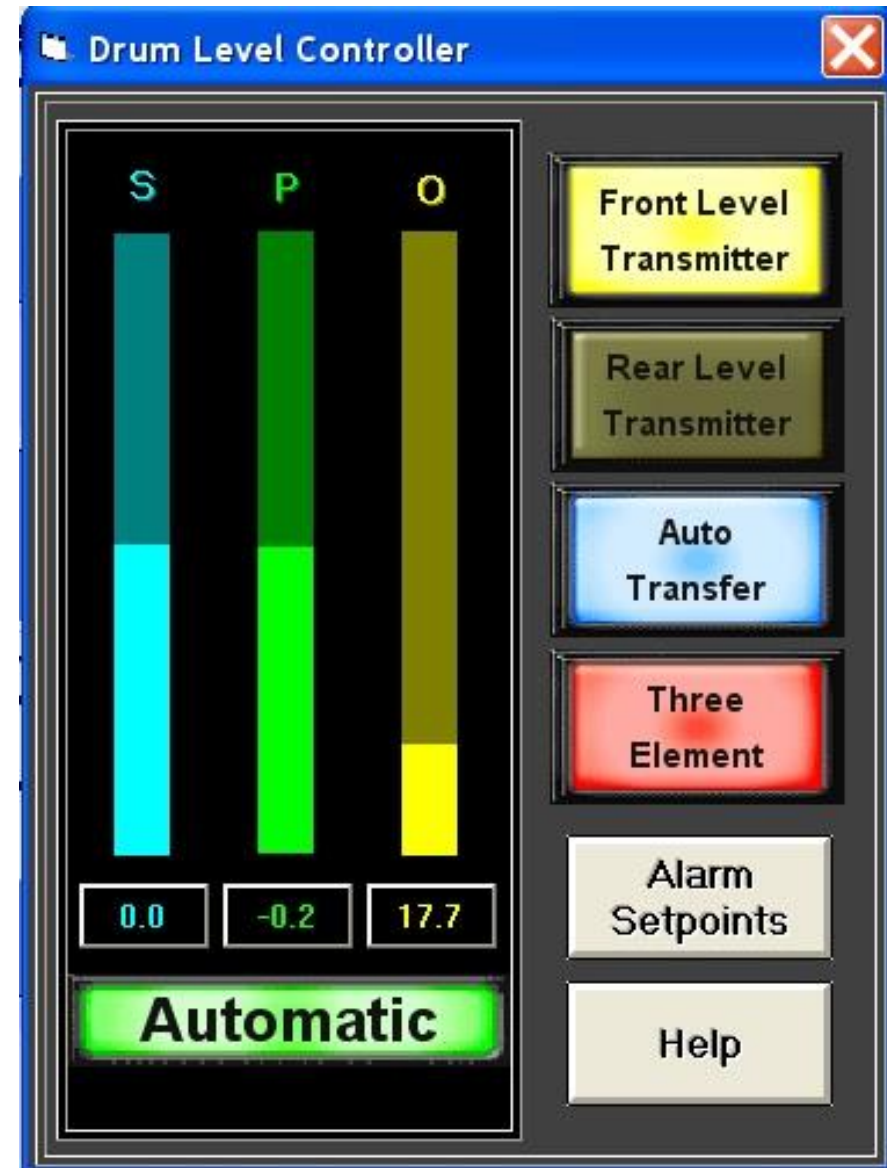
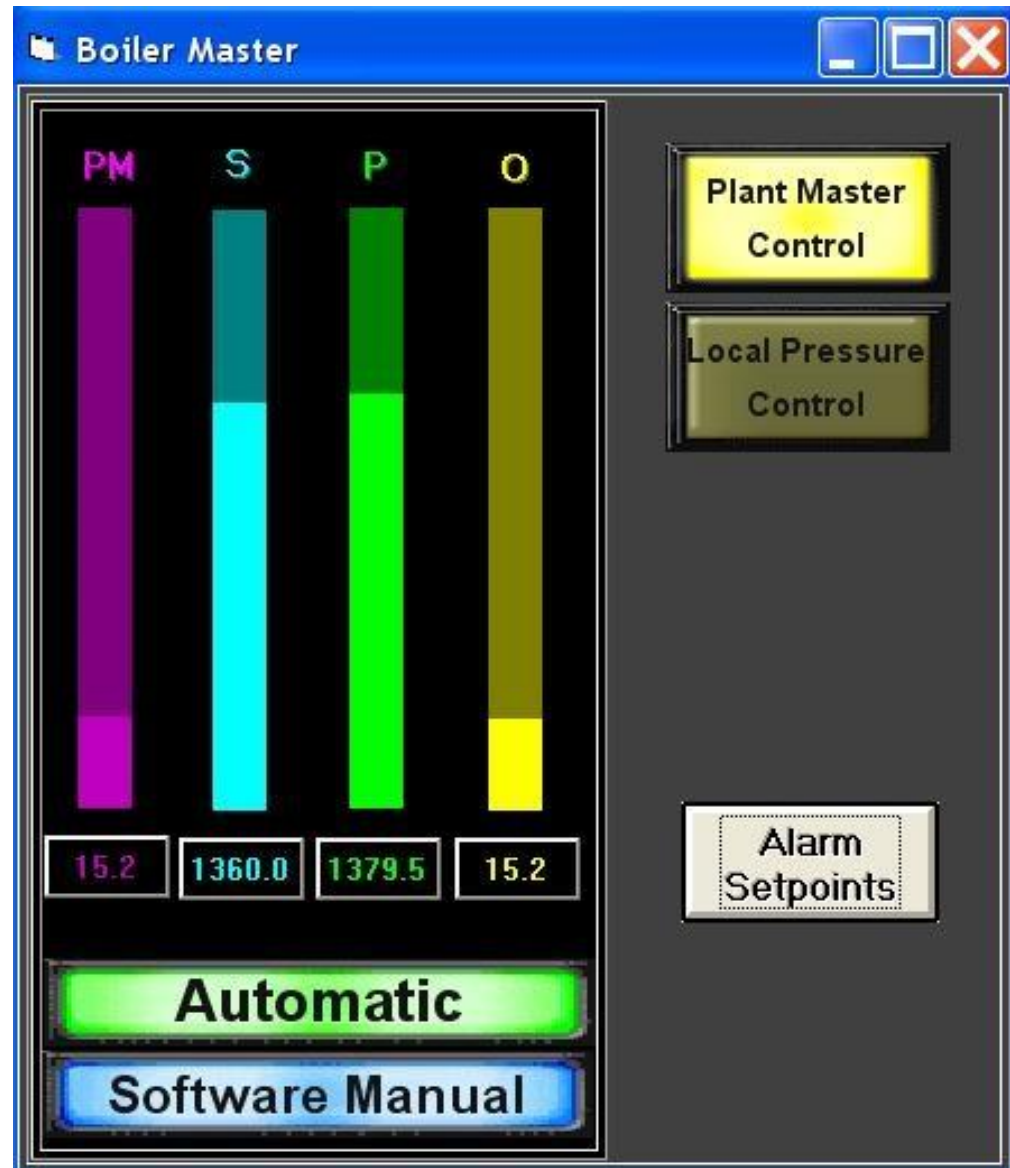


Accepted as HMI alternative to Institutional Users

Wonderware, Intellution, RSView all used VB



Boiler VB6 HMI Screen



Then Came Windows 10 – 64bit OS

- VB6 phased out in favor of Visual Basic.Net
 - Required rewriting VB6
 - Customer friction to New Programs inferred Custom Compu-NOx using site selected HMI platform

Solution

— Stick with VB and Use Excel as HMI

Advantages

- Everyone has and uses it
 - Inexpensive
 - Easy to use
 - Simple
 - Ubiquitous Communication
- Active X

Disadvantages

- No one uses Excel as an HMI

Breaking Free of Proprietary Software

One license does it

Cross Device Compatibility

Inherent Data Logging

Anyone with Excel Can Run it

Unlimited Tags

Simple

Modbus

At least 20
different
Active X for
Excel for
Modbus coms

- Unlimited run time typical

Modbus is
widely used
as
Communication

- VFDs, valves, PLCs, etc

MBAXP

Accessing data from a Modbus slave device connected to the PC

Protocol variants:

- Modbus RTU
- Modbus ASCII
- Modbus TCP/IP

Supported Modbus Functions:

- 01: Read coil status
- 02: Read input status
- 03: Read holding registers
- 04: Read input registers
- 05: Force single coil
- 06: Preset single register
- 15: Force multiple coils
- 16: Preset multiple registers
- 23: Read/Write registers

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Set-up

Mbaxp1.Connection = 0 '0 = TCP/IP

Mbaxp1.IPAAddr1 = IP1

Mbaxp1.IPAAddr2 = IP2

Mbaxp1.IPAAddr3 = IP3

Mbaxp1.IPAAddr4 = IP4

Mbaxp1.TCIPPort = 502

Mbaxp1.Timeout = 1000 ' Read timeout

Mbaxp1.ConnectTimeout = 2000 ' TCP/IP Connection timeout

Mbaxp1.LicenseKey ("xxxx-xxxx-xxxx-xxxx-xxxx-xxxx")

e = Mbaxp1.OpenConnection

e = Mbaxp1.GetLastError

If e = 0 Then

Cells(3, 2) = "Connection success"

Main.Range(Cells(1, 1), Cells(40, 16)).Interior.Color =
RGB(Settings.Cells(46, 1), Settings.Cells(46, 2), Settings.Cells(46, 3))

ElseIf e = 34 Then

Cells(3, 2) = "Connection timeout"

ElseIf e <> 0 Then

Cells(3, 2) = "Connection Error"

End If



Populate Cells



```
Private Sub Mbaxp1_ResultOk(ByVal Handle As Integer)
```

```
If Not Application.Ready Then
```

```
GoTo skiptoend
```

```
End If
```

```
If Application.Ready Then
```

```
sss = Handle
```

```
End If
```

```
If Handle = 1 And Application.Ready Then 'Primary trigger array
```

```
'r100 to r130 curves fuel flow setpoint
```

```
' for 15 reals as per spec
```

```
For i = 0 To 30
```

```
mbdata = Mbaxp1.Float(1, I)
```

```
ArrayH1(i) = Round(mbdata, 2)
```

```
Next i
```

```
-----place the data where it needs to be in the HMI screen
```

```
Range(Cells(1, 20), Cells(31, 20)).Value = Application.Transpose(ArrayH1)
```

```
Range(Cells(22, 6), Cells(27, 6)).Value = Range(Cells(1, 20), Cells(31, 20)).Val
```

```
'update the date time on the main screen
```

```
Cells(1, 10) = VBA.Format(Now(), "dddd, mmm d hh:mm:ss")
```



Avoid Updating Buttons on Excel Sheets Microsoft Bugaboo

- Button Updating cause Hangs
- If MCold(10) <> MC(10) Then
- 'took outl 11-1-18 then 11-23-18 added it back in because holy crap the memory started going apeshit and crashing the Excel.
- Application.EnableEvents = False 'added this workaround to keep other code from firing
- If MC(10) Then
- Main.offon.Value = MC(10)
- Main.offon.Caption = "Boiler On"
- Main.offon.BackColor = RGB(0, 200, 0) '&HFF&
- Else
- Main.offon.Value = False
- Main.offon.Caption = "Boiler Off"
- Main.offon.BackColor = RGB(200, 0, 0) '&HC0C0C0
- End If
- End If

Questions?

Comments:

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