

BAB 5. KESIMPULAN DAN SARAN

5.1 Kesimpulan

Berdasarkan hasil pengujian dan analisis yang telah dikemukakan pada bab 4 hasil dan pembahasan, maka dapat diambil kesimpulan sebagai berikut :

1. Pada penelitian ini, instalasi 2 motor listrik pada circulating water channel (CWC) digunakan sebagai pembuat aliran air yang mana pada tegangan maksimal 12V DC menghasilkan kecepatan aliran 12 m/s pada masing-masing motor.
2. Sistem pengontrol kecepatan rotasi motor listrik DC menggunakan pengontrolan dengan sistem pulse width modulation (PWM) dan menggunakan sensor RPM, sensor tegangan, dan sensor flow meter yang digunakan untuk mengukur nilai dari monitoring, dengan alat ukur tachometer, multimeter, dan current meter flow sebagai perbandingan untuk mengkalibrasi sensor yang digunakan.

5.2 Saran

Berdasarkan penelitian yang telah penulis lakukan, maka penulis menyarankan beberapa hal sebagai berikut :

1. Untuk penelitian selanjutnya penulis sarankan untuk mengembangkan penelitian menggunakan kontroler pada 2 mesin DC 12V sebagai pengatur arah aliran yang di inginkan dan bisa mematikan salah satu mesin dengan kontroler tersebut guna sebagai kontrol belokan aliran.
2. Karakteristik sensor perlu dikaji lebih dalam lagi, guna diketahui karakteristik sensor yang akan digunakan dalam pengujian penelitian selanjutnya.
3. Dalam penelitian selanjutnya, sebaiknya dibangun sebuah bangunan kapal nelayan untuk memonitoring dan mengetahui apakah motor DC 12V ini bisa digunakan pada penerapan sebenarnya.

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Lampiran 1 Kode Program

Arduino

```

#define vpin A0
#include <Wire.h>
#include <SPI.h>

float R1 = 30000.0;
float R2 = 7500.0;
float R3 = 8400.0;
float R4 = 1000.0;

float vout;
String txData2="";
float ms;
char T_string[10];
String f;
volatile int NbTopsFan;
int Calc;
int hallsensor = 2;

float rpm1 = 0;
int pid;
unsigned long millisBefore;
volatile int holes;

//float vref = 5.0;
//int res_bit = 1023;
void rpm ()
{
NbTopsFan++;
}

void setup() {
  // put your setup code here, to run once:
  Serial.begin(9600);
  Wire.begin();

  pinMode(hallsensor, INPUT); //initializes digital pin 2 as an input
  attachInterrupt(0, rpm, RISING);
  pinMode(3, INPUT);
  attachInterrupt(digitalPinToInterrupt(3), count, FALLING);

  delay(1000);
}

void loop() {
  //Hitung Tegangan
  // put your main code here, to run repeatedly:

```

```

float a_t=0, b_t=0, c_t=0, tegangan=0, sample_t=0;
for(int i=0;i<100;i++){

    a_t = analogRead(vpin);
    sample_t = sample_t + a_t;
    b_t =sample_t/100.0;

}
c_t = (b_t*2.4)/1023.0;
tegangan = c_t/(R4/(R3+R4));

//Hitung Flow Meter

NbTopsFan = 0; //Set NbTops to 0ready for calculations
sei(); //Enables interrupts
delay (500); //Wait 5 minute
cli(); //Disable interrupts
ms = (((NbTopsFan/57500.00)*3)*1.9); // menghitung kecepatan aliran

//Hitung Rpm
if (millis() - millisBefore > 1000) {
    rpm1 = (((((((holes)/4.717)*3)*3)*1.7)*3.5)*2)/7.8);
    holes = 0;
    millisBefore = millis();
}

Serial.print(tegangan);
Serial.print(";");
Serial.print(rpm1); //Prints the number calculated above54
Serial.print(";"); //Prints "m/s" and returns a new line
Serial.print(ms);
Serial.print("\n");

delay(1000);
}

void count() {
    holes++;
}

```

Visual Basic

```

Imports ZedGraph
Imports System.Data.OleDb
Public Class Form1

    Dim flag_masuk As Integer
    Dim flag_masuk30 As Integer
    Dim flag_first As Integer
    Dim hitung_masuk As Integer

```

```
Dim time_last As Integer
Dim time_temp As Integer
Dim time_interval As Integer
Dim time_now As Integer
Dim time_set As Integer

Dim currentgraph As GraphPane
Dim listcurrent As RollingPointPairList
Dim currentgraph_line As LineItem

Dim currentgraph2 As GraphPane
Dim listcurrent2 As RollingPointPairList
Dim currentgraph_line2 As LineItem

Dim currentgraph3 As GraphPane
Dim listcurrent3 As RollingPointPairList
Dim currentgraph_line3 As LineItem

Dim currentgraph4 As GraphPane
Dim listcurrent4 As RollingPointPairList
Dim currentgraph_line4 As LineItem

Dim currentgraph5 As GraphPane
Dim listcurrent5 As RollingPointPairList
Dim currentgraph_line5 As LineItem

Dim currentgraph6 As GraphPane
Dim listcurrent6 As RollingPointPairList
Dim currentgraph_line6 As LineItem

Dim starting_time As Double = 0 '100
Dim nilai As Single
Dim nilai2 As Single
Dim nilai3 As Single
Dim nilai4 As Single
Dim nilai5 As Single
Dim nilai6 As Single
Dim nilai7 As Single
Dim nilai8 As Single
Dim nilai9 As Single

Dim Folder As String = Environment.CurrentDirectory + "\\Backup\\"

Sub TimerZedgraph()
    Dim xScale As Scale
    Dim kurvaTegangan As LineItem = GrafikTegangan.GraphPane.CurveList(0)
```

```

'Dim xRange As Double = currentgraph.XAxis.Scale.Max - currentgraph.XAxis.Scale.Min
Dim list As IPointListEdit
Dim waktu As Double = (Environment.TickCount - starting_time) / 1000.0

'Label6.Text = Environment

'starting_time = starting_time + 1
'Dim waktu As Double = starting_time
list = kurvaTegangan.Points

list.Add(waktu, nilai)

xScale = GrafikTegangan.GraphPane.XAxis.Scale

If (waktu > xScale.Max - xScale.MajorStep) Then
    xScale.Max = waktu + xScale.MajorStep
    xScale.Min = xScale.Max - 10
End If

'Pastikan Y axis di scale ulang untuk mengakomodir data aktual

GrafikTegangan.AxisChange()
'Redraw paksa
GrafikTegangan.Invalidate()

End Sub

Sub TimerZedgraph2()
    Dim xScale As Scale
    Dim kurvaSuhu As LineItem = GrafikRpm.GraphPane.CurveList(0)
    Dim list As IPointListEdit
    Dim waktu As Double = (Environment.TickCount - starting_time) / 1000.0

    'Label6.Text = Environment

    'starting_time = starting_time + 1
    'Dim waktu As Double = starting_time
    list = kurvaSuhu.Points

    list.Add(waktu, nilai2)

    xScale = GrafikRpm.GraphPane.XAxis.Scale
    If (waktu > xScale.Max - xScale.MajorStep) Then
        xScale.Max = waktu + xScale.MajorStep
        xScale.Min = xScale.Max - 10
    End If

    'Pastikan Y axis di scale ulang untuk mengakomodir data aktual

```

```

    GrafikRpm.AxisChange()
    ' Redraw paksa
    GrafikRpm.Invalidate()
End Sub

Sub TimerZedgraph3()
    Dim xScale As Scale
    Dim kurvaIntensitas As LineItem = GrafikKecepatanaliran.GraphPane.CurveList(0)
    Dim list As IPointListEdit
    Dim waktu As Double = (Environment.TickCount - starting_time) / 1000.0

    'Label6.Text = Environment

    'starting_time = starting_time + 1
    'Dim waktu As Double = starting_time
    list = kurvaIntensitas.Points

    list.Add(waktu, nilai3)

    xScale = GrafikKecepatanaliran.GraphPane.XAxis.Scale
    If (waktu > xScale.Max - xScale.MajorStep) Then
        xScale.Max = waktu + xScale.MajorStep
        xScale.Min = xScale.Max - 10
    End If
    ' Pastikan Y axis di scale ulang untuk mengakomodir data aktual
    GrafikKecepatanaliran.AxisChange()
    ' Redraw paksa
    GrafikKecepatanaliran.Invalidate()
End Sub

Private Sub port_avalible()
    cmbComPort.Items.Clear()
    For Each port_name As String In IO.Ports.SerialPort.GetPortNames
        Dim myPort As New IO.Ports.SerialPort(port_name)
        cmbComPort.Items.Add(port_name)

        cmbComPort.Text = port_name

    Next
End Sub

Private Sub Form1_Load(ByVal sender As System.Object, ByVal e As System.EventArgs) Handles MyBase.Load
    Label10.Text = String.Format("{0} {1}.csv", DateTime.Now.ToString("dd MMMM yyy HHmmss"),
        TextBox1.Text)
    Folder = Folder + Label10.Text

```



```

ComboBox_time.Text = "1"
ComboBox_detik.Text = "Detik"
sep = ","

If Val(Label_now.Text) < 0 Then
    Label_now.Text = "00"
End If

Label18.Text = Val(Label_now.Text) + 30
If Val(Label18.Text) > 60 Then
    Label18.Text = Val(Label_now.Text) - 30
End If

time_set = 0

flag_terima = 0
flag_first = 0
flag_masuk = 0

'starting_time = Environment.TickCount
currentgraph = GrafikTegangan.GraphPane
'Dim xRange As Double = currentgraph.XAxis.Scale.Max - currentgraph.XAxis.Scale.Min
'currentgraph.XAxis.Scale.Max = New XDate(DateTime.Now)
'currentgraph.XAxis.Scale.Min = currentgraph.XAxis.Scale.Max - xRange
currentgraph.Title.Text = "Tegangan"
currentgraph.XAxis.Title.Text = "Time(S)"
currentgraph.YAxis.Title.Text = "Tegangan (V)"
'currentgraph.YAxis.Scale.Min = 0
'currentgraph.YAxis.Scale.Max = 10
listcurrent = New RollingPointPairList(6000)
currentgraph_line = currentgraph.AddCurve("V", listcurrent, Color.Blue, SymbolType.None)
currentgraph_line.Line.Width = 3
currentgraph_line.Line.IsSmooth = True
'currentgraph.XAxis.Type = AxisType.Date
'currentgraph.XAxis.Scale.FontSpec.Angle = 65
'currentgraph.XAxis.Scale.MajorStep = 1
'currentgraph.XAxis.Scale.MajorUnit = DateUnit.Minute
'currentgraph.XAxis.Scale.MinorUnit = DateUnit.Second
'currentgraph.XAxis.Scale.Format = DateTime.Now.ToString("HH.mm.ss")
GrafikTegangan.AxisChange()

'starting_time = Environment.TickCount
currentgraph2 = GrafikRpm.GraphPane
currentgraph2.Title.Text = "Suhu"
currentgraph2.XAxis.Title.Text = "Time(S)"

```

```

currentgraph2.YAxis.Title.Text = "Suhu (°C)"
listcurrent2 = New RollingPointPairList(6000)
currentgraph_line2 = currentgraph2.AddCurve("C", listcurrent2, Color.RosyBrown, SymbolType.None)
currentgraph_line2.Line.Width = 3
currentgraph_line2.Line.IsSmooth = True
'curve.Line.IsSmooth = True
'currentgraph2.XAxis.Type = AxisType.Date
'currentgraph2.XAxis.Scale.FontSpec.Angle = 65
'currentgraph2.XAxis.Scale.MajorStep = 1
'currentgraph2.XAxis.Scale.MajorUnit = DateUnit.Minute
'currentgraph2.XAxis.Scale.MinorUnit = DateUnit.Second
'currentgraph2.XAxis.Scale.Format = DateTime.Now.ToString("HH.mm.ss")
GrafikRpm.AxisChange()

```

```

'starting_time = Environment.TickCount
currentgraph4 = GrafikKecepatanaliran.GraphPane
currentgraph4.Title.Text = "Kecepatan Aliran"
currentgraph4.XAxis.Title.Text = "Time(S)"
currentgraph4.YAxis.Title.Text = "Kecepatan aliran (m/s)"
listcurrent4 = New RollingPointPairList(6000)
currentgraph_line4 = currentgraph4.AddCurve("Lux", listcurrent4, Color.Green, SymbolType.None)
currentgraph_line4.Line.Width = 3
currentgraph_line4.Line.IsSmooth = True
'curve.Line.IsSmooth = True
'currentgraph4.XAxis.Type = AxisType.Date
'currentgraph4.XAxis.Scale.FontSpec.Angle = 65
'currentgraph4.XAxis.Scale.MajorStep = 1
'currentgraph4.XAxis.Scale.MajorUnit = DateUnit.Minute
'currentgraph4.XAxis.Scale.MinorUnit = DateUnit.Second
'currentgraph4.XAxis.Scale.Format = DateTime.Now.ToString("HH.mm.ss")
GrafikKecepatanaliran.AxisChange()

```

```

'starting_time = Environment.TickCount
currentgraph6 = GrafikRpm.GraphPane
currentgraph6.Title.Text = "RPM"
currentgraph6.XAxis.Title.Text = "Time(S)"
currentgraph6.YAxis.Title.Text = "Rpm"
listcurrent6 = New RollingPointPairList(6000)
currentgraph_line6 = currentgraph6.AddCurve("o", listcurrent6, Color.BlueViolet, SymbolType.None)
currentgraph_line6.Line.Width = 3
currentgraph_line6.Line.IsSmooth = True
'curve.Line.IsSmooth = True
'currentgraph6.XAxis.Type = AxisType.Date
'currentgraph6.XAxis.Scale.FontSpec.Angle = 65
'currentgraph6.XAxis.Scale.MajorStep = 1
'currentgraph6.XAxis.Scale.MajorUnit = DateUnit.Minute

```

```
'currentgraph6.XAxis.Scale.MinorUnit = DateUnit.Second
'currentgraph6.XAxis.Scale.Format = DateTime.Now.ToString("HH.mm.ss")
GrafikRpm.AxisChange()
```

```
Try
```

```
    TabControl1.Appearance = TabAppearance.FlatButtons
    TabControl1.ItemSize = New Size(0, 1)
    TabControl1.SizeMode = TabSizeMode.Fixed
```

```
Catch ex As Exception
```

```
End Try
```

```
'ListView1.View = View.Details
```

```
"ListView1.Columns.Add("Tanggal Jam", 130)
```

```
"ListView1.Columns.Add("Tegangan Tracker (V)", 130)
```

```
"ListView1.Columns.Add("Tegangan Fixed (V)", 130)
```

```
"ListView1.Columns.Add("Temp (C)", 70)
```

```
"ListView1.Columns.Add("Tegangan Tracker (V)", 130)
```

```
"ListView1.Columns.Add("Intensitas Fixed (Lux)", 130)
```

```
"ListView1.Columns.Add("Sudut (o)", 70)
```

```
'ListView1.GridLines = True
```

```
'Dim conn As New OleDbConnection("Provider=Microsoft.ACE.OLEDB.12.0;Data
source=D:\cobaexcel.xlsx;Extended Properties=Excel 8.0")
```

```
'conn.Open()
```

```
'Dim cmd As New OleDbCommand("Select * from [Sheet1$]", conn)
```

```
'Dim da As OleDbDataReader = cmd.ExecuteReader
```

```
'Do While da.Read = True
```

```
    ' Dim list1 = ListView1.Items.Add(da(0))
```

```
    ' list1.SubItems.Add(da(1))
```

```
    ' list1.SubItems.Add(da(2))
```

```
    ' list1.SubItems.Add(da(3))
```

```
    ' list1.SubItems.Add(da(4))
```

```
    ' list1.SubItems.Add(da(5))
```

```
    ' list1.SubItems.Add(da(6))
```

```
'Loop
```

```
' conn.Close()
```

```
End Sub
```

```
Private Sub Timer_jam_Tick(ByVal sender As System.Object, ByVal e As System.EventArgs) Handles
```

```
    Timer_jam.Tick
```

```
    Label12.Text = DateTime.Now.ToString("dd MMM yyy HH:mm:ss")
```

```
If ComboBox_time.Text = "60" Then
```

```
    If ComboBox_detik.Text = "Menit" Then
```

```

        Label_now.Text = Val(TimeOfDay.ToString("HH"))
    Else
        Label_now.Text = Val(TimeOfDay.ToString("mm"))
    End If
Else
    If ComboBox_detik.Text = "Menit" Then
        Label_now.Text = Val(TimeOfDay.ToString("mm"))
    Else
        Label_now.Text = Val(TimeOfDay.ToString("ss"))
    End If
End If

If flag_masuk = 1 Then
    If flag_terima = 1 Then
        flag_terima = 0
        Label7.Text = nilai_tegangantracker.ToString("0.0")
        Label8.Text = nilai_teganganfixed.ToString("0.0")
        Label11.Text = nilai_temp.ToString("0.0")

        nilai = nilai_tegangantracker
        nilai2 = nilai_temp
        nilai3 = nilai_teganganfixed
        'nilai4 = nilai_Intensitracker
        'nilai5 = nilai_IntensitasFixed
        'nilai6 = nilai_sudut
        'nilai7 = nilai_KalRoll
        'nilai8 = nilai_Pitch
        'nilai9 = nilai_KalPitch

        If flag_first = 0 Then 'UNTUK HEADER
            flag_first = 1
            RichTextBox1.AppendText("Tanggal Jam" + sep + "Tegangan (V)" + sep + "Kecepatan aliran
(m/s)" + sep + "Putaran Motor (rpm)" + vbNewLine)

        End If

        Call isi_list_view()
        Call isi_rich_text()
        Call TimerZedgraph()
        Call TimerZedgraph2()
        Call TimerZedgraph3()

        RichTextBox1.SaveFile(Folder, RichTextBoxStreamType.PlainText)

    End If

```

```

If time_set = 0 Then
    time_set = 1
    time_temp = time_last + time_interval '19=17+2
    If time_temp >= 60 Then
        time_temp = time_temp - 60
    End If
End If

Label_temp.Text = time_temp '19
Label_start.Text = time_last '19

time_now = Val(Label_now.Text)
If time_now = time_temp Then
    Try
        time_last = time_temp
        SerialPort_data.Write("c")
        time_set = 0

    Catch
        MessageBox.Show("Error")
        CheckBox1.Checked = False
        flag_masuk = 0
        If SerialPort_data.IsOpen Then
            SerialPort_data.Close()
        End If
    End Try
End If
End If

End Sub

Private Sub Button2_Click(ByVal sender As System.Object, ByVal e As System.EventArgs) Handles
    Button2.Click
        SaveFileDialog1.Filter = "csv files (*.csv)|*.csv"

        SaveFileDialog1.FileName = String.Format("{0} {1}.csv", DateTime.Now.ToString("dd MMMM yyy
            HHmmss"), TextBox1.Text)

        If SaveFileDialog1.ShowDialog() = System.Windows.Forms.DialogResult.OK And
            SaveFileDialog1.FileName.Length > 0 Then
            RichTextBox1.SaveFile(SaveFileDialog1.FileName, RichTextBoxStreamType.PlainText)
        End If

End Sub

```

```

Sub isi_list_view()
    Dim lvi As New ListViewItem(DateTime.Now.ToString("dd MMM yyy HH.mm.ss"))
    lvi.SubItems.Add(nilai_tegangantracker)
    lvi.SubItems.Add(nilai_teganganfixed)
    lvi.SubItems.Add(nilai_temp)
    ' lvi.SubItems.Add(nilai_Intensitastracker)
    ' lvi.SubItems.Add(nilai_IntensitasFixed)
    ' lvi.SubItems.Add(nilai_sudut)
    ' lvi.SubItems.Add(nilai_KalRoll)
    ' lvi.SubItems.Add(nilai_Pitch)
    ' lvi.SubItems.Add(nilai_KalPitch)
    ListView1.Items.Add(lvi)

    lvi.Selected = True
    lvi.EnsureVisible()
    lvi = Nothing
End Sub

Dim sep As String
Sub isi_rich_text()
    RichTextBox1.AppendText(DateTime.Now.ToString("dd MMM yyy HH.mm.ss") + sep +
        nilai_tegangantracker.ToString() + sep + nilai_teganganfixed.ToString() + sep + nilai_temp.ToString()
        + vbNewLine)
    RichTextBox1.ScrollToCaret()
End Sub

Dim state_buzzer As Integer
Dim state_fan As Integer
Dim state_lampu As Integer

Dim nilai_tegangantracker As Double
Dim nilai_teganganfixed As Double
Dim nilai_temp As Double
Dim nilai_Intensitastracker As Double
Dim nilai_IntensitasFixed As Double
Dim nilai_sudut As Double
Dim nilai_KalRoll As Double
Dim nilai_Pitch As Double
Dim nilai_KalPitch As Double

Dim temp_atas_bayi As Double
Dim temp_bawah_bayi As Double
Dim temp_atas_ruang As Double
Dim temp_bawah_ruang As Double

Dim s As String

```

```
Dim sp() As String
```

```
Dim flag_terima As Integer
```

```
Dim flag_terima_first As Integer
```

```
Private Sub SerialPort_data_DataReceived(ByVal sender As System.Object, ByVal e As System.IO.Ports.SerialDataReceivedEventArgs) Handles SerialPort_data.DataReceived
```

```
    Dim str As String
```

```
    str = SerialPort_data.ReadLine()
```

```
    s = str 'this text box contains value (08:00-17:41)
```

```
    sp = s.Split(";")
```

```
    nilai_tegangantracker = Val(sp(0))
```

```
    nilai_temp = Val(sp(1))
```

```
    nilai_teganganfixed = Val(sp(2))
```

```
    'nilai_Intensitracker = Val(sp(3))
```

```
    'nilai_IntensitasFixed = Val(sp(4))
```

```
    'nilai_sudut = Val(sp(5))
```

```
    'nilai_KalRoll = Val(sp(6))
```

```
    'nilai_Pitch = Val(sp(7))
```

```
    'nilai_KalPitch = Val(sp(8))
```

```
    'TANDA ADA DATA DITERIMA
```

```
    flag_terima = 1
```

```
End Sub
```

```
Private Sub Button1_Click(ByVal sender As System.Object, ByVal e As System.EventArgs) Handles Button1.Click
```

```
    Dim result As Integer = MessageBox.Show("Aplikasi akan ditutup?", "Caution", MessageBoxButtons.YesNo)
```

```
    If result = DialogResult.No Then
```

```
        Activate()
```

```
    ElseIf result = DialogResult.Yes Then
```

```
        If SerialPort_data.IsOpen Then
```

```
            SerialPort_data.Close()
```

```
        End If
```

```
        Application.Exit()
```

```
    End If
```

```
End Sub
```

```
Private Sub CheckBox1_CheckedChanged(ByVal sender As Object, ByVal e As EventArgs) Handles CheckBox1.CheckedChanged
```

```

If CheckBox1.Checked = True Then
    Try
        ComboBox_detik.Enabled = False
        ComboBox_time.Enabled = False
        cmbComPort.Enabled = False
        SerialPort_data.PortName = cmbComPort.Text
        SerialPort_data.Open()
        SerialPort_data.Write("c")

        flag_masuk = 1
        time_set = 0
        time_last = Val(Label_now.Text)
        If ComboBox_time.Text = "60" Then
            time_interval = 1
        Else
            time_interval = Val(ComboBox_time.Text)
        End If
        Label_start.Text = time_last

    Catch
        MessageBox.Show("Error")
        CheckBox1.Checked = False
    End Try
Else
    ComboBox_detik.Enabled = True
    ComboBox_time.Enabled = True
    cmbComPort.Enabled = True

    flag_masuk = 0
    If SerialPort_data.IsOpen Then
        SerialPort_data.Close()
    End If
End If
End Sub

Private Sub cmbComPort_Click(ByVal sender As Object, ByVal e As EventArgs) Handles
    cmbComPort.Click
        port_avalible()
End Sub

Private Sub NewRecordToolStripMenuItem_Click(ByVal sender As System.Object, ByVal e As
    System.EventArgs) Handles NewRecordToolStripMenuItem.Click
    Dim result As Integer = MessageBox.Show("Data akan hilang?", "Caution", MessageBoxButtons.YesNo)

```



```

If result = DialogResult.No Then
    Activate()
ElseIf result = DialogResult.Yes Then
    If SerialPort_data.IsOpen Then
        SerialPort_data.Close()
    End If
    Application.Restart()
End If

```

```
End Sub
```

```

Private Sub ExitToolStripMenuItem_Click(ByVal sender As System.Object, ByVal e As
    System.EventArgs) Handles ExitToolStripMenuItem.Click
    Dim result As Integer = MessageBox.Show("Aplikasi akan ditutup?", "Caution",
        MessageBoxButtons.YesNo)

```

```

If result = DialogResult.No Then
    Activate()
ElseIf result = DialogResult.Yes Then
    If SerialPort_data.IsOpen Then
        SerialPort_data.Close()
    End If
    Application.Exit()
End If

```

```
End Sub
```

```

Private Sub Button4_Click(ByVal sender As System.Object, ByVal e As System.EventArgs) Handles
    Button4.Click
    Process.Start(Environment.CurrentDirectory + "\\Backup\\")

```

```
End Sub
```

```

Private Sub btnDashboard_Click(sender As Object, e As EventArgs) Handles btnDashboard.Click,
    btnArus.Click
    Try
        Dim Mybutton = DirectCast(sender, Button)

```

```

        Select Case Mybutton.Name
            Case "btnDashboard"
                TabControl1.SelectedTab = tabPage1
            Case "btnArus"
                TabControl1.SelectedTab = tabPage2

```

```
        End Select
```

```
Catch ex As Exception
```

End Try

End Sub

```
Private Sub btn_simpangrafik_Click(ByVal sender As System.Object, ByVal e As System.EventArgs)
```

```
    Handles btn_simpangrafik.Click
```

```
    'create Bitmap recipient
```

```
    Dim bm As Bitmap
```

```
    bm = New Bitmap(1, 1)
```

```
    'measure the chart to size the bitmap
```

```
    Dim G As Graphics
```

```
    G = Graphics.FromImage(bm)
```

```
    Me.GrafikTegangan.GraphPane.AxisChange(G)
```

```
    'save the file of the chart on disk (PNG format)
```

```
    Me.GrafikTegangan.GraphPane.GetImage().Save("E://Grafik//grafik    tegangan    tracker.png",
```

```
        System.Drawing.Imaging.ImageFormat.Png)
```

```
    Dim bm2 As Bitmap
```

```
    bm2 = New Bitmap(1, 1)
```

```
    'measure the chart to size the bitmap
```

```
    Dim G2 As Graphics
```

```
    G2 = Graphics.FromImage(bm)
```

```
    Me.GrafikKecepatanaliran.GraphPane.AxisChange(G)
```

```
    'save the file of the chart on disk (PNG format)
```

```
    Me.GrafikKecepatanaliran.GraphPane.GetImage().Save("E://Grafik//grafik    Intensitas    Fixed.png",
```

```
        System.Drawing.Imaging.ImageFormat.Png)
```

```
    Dim bm3 As Bitmap
```

```
    bm3 = New Bitmap(1, 1)
```

```
    'measure the chart to size the bitmap
```

```
    Dim G3 As Graphics
```

```
    G3 = Graphics.FromImage(bm)
```

```
    Me.GrafikRpm.GraphPane.AxisChange(G)
```

```
    'save the file of the chart on disk (PNG format)
```

```
    Me.GrafikRpm.GraphPane.GetImage().Save("E://Grafik//grafik    suhu.png",
```

```
        System.Drawing.Imaging.ImageFormat.Png)
```

End Sub

End Class

Lampiran 2 Proses Pembuatan alat, Pengkalibrasi alat dan pengambilan data



Proses perakitan kabel motor agar aman di gunakan dalam air.



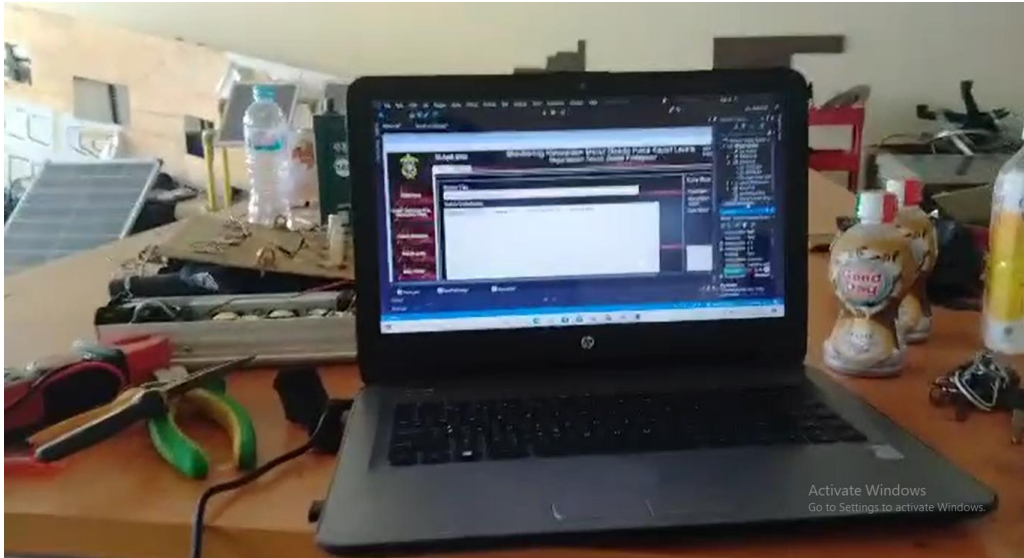
Pembuatan stang untuk dudukan motor pada cwc



Penguji cobaan putaran motor yang telah di rakit untuk mengetahui putaran kedua motor sama.



Proses pembuatan coding Arduino untuk membaca sensor yang digunakan.



Pembuatan aplikasi visual basic sebagai media penampilan data yang di baca pada Arduino.



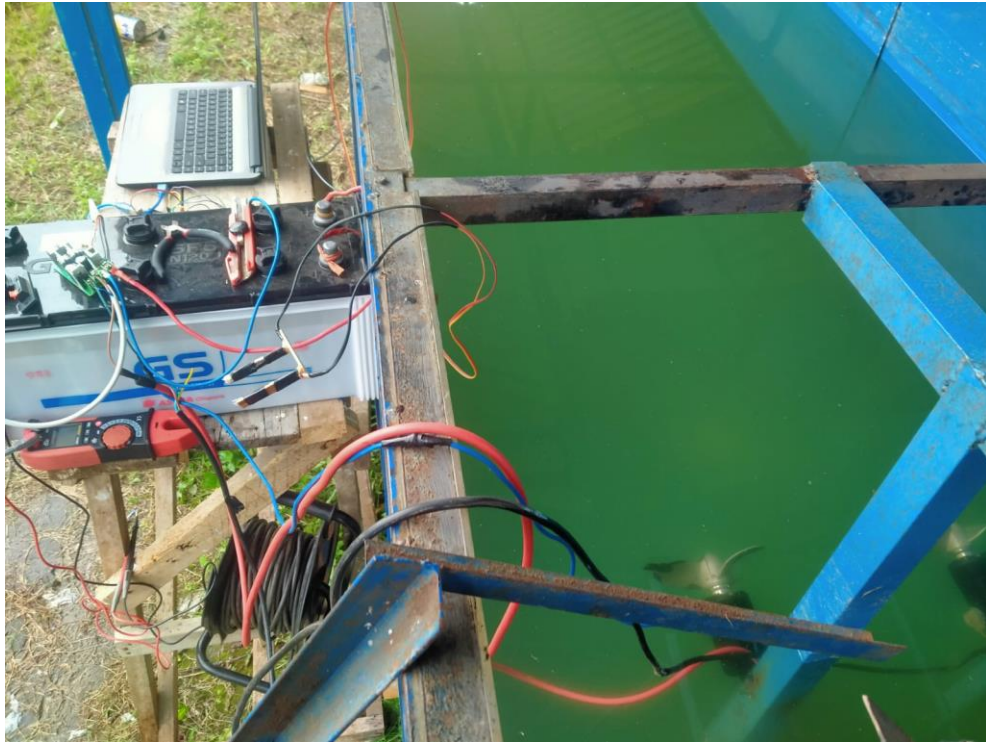
Pengkalibrasian flowmeter sensor dengan menggunakan Current Meter Flow watch.



Proses pengkalibrasian sensor rpm dan flowmeter sensor dengan menggunakan Tachometer dan Current Meter Flow watch



Proses pengambilan data dengan menggunakan sensor rpm dan flowmeter sensor



Instalasi kabel sambungan untuk menjalan motor DC



Instalasi kabel sensor voltage, sensor rpm, dan flometer sensor yang disambungkan ke Arduino uno lalu Arduino uno di sambungkan ke Laptop.