

# WW Pmod SMLD Quality Control System

This project builds, maintains a database, and monitors SSVE Pmod performance by week.

It minimizes significant labor hours, eliminates human errors and speeds up the whole process.

This project makes monitoring WW Pmod SMLD Quality in real time possible.

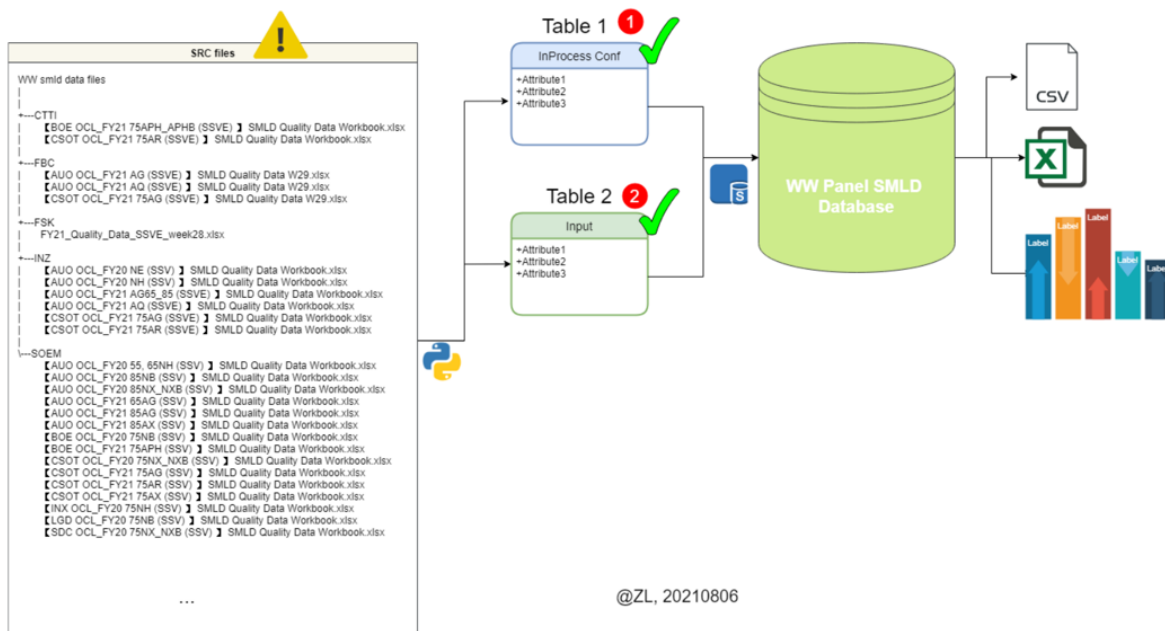
## Author

SSVE TVQA member @Zhang Liang, 20210804

## Changelog

- v0.01, initial build
- v0.02, clean and format algorithms
- v0.03, change design pattern: split into two dataframes: defects, inputs
- v0.04, add more columns to prepare for visualization
- v0.05, fix TVPlant column, "SO'EM" -> "SOEM"
- v0.06, add an option to run `main.py` by using `main.bat` (Batch script)
- v0.07, refactor the core using `Builder` design pattern
- v0.08, restructure the dependency structure (divide-and-conquer)

## Schema



## Project structure

```
C:.\
| .gitignore
| 20210806 WW_Panel_SMLD_Database v0.02.pptx
```

```
main.bat
main.py
requirements.txt

data
├── CTTI
│   ├── 【BOE OCL_FY21 75APH_APHB (SSVE) 】 SMLD Quality Data Workbook.xlsx
│   └── ...
├── FBC
│   ├── 【AUO OCL_FY21 AG (SSVE) 】 SMLD Quality_W49.xlsx
│   └── ...
├── FSK
│   └── FY21_Quality_Data_SSVE_week50.xlsx
├── INZ
│   ├── 【AUO OCL_FY20 NH (SSV) 】 SMLD Quality Data Workbook.xlsx
│   └── ...
└── SOEM
    ├── 【AUO OCL_FY20 55, 65NH (SSV) 】 SMLD Quality Data Workbook.xlsx
    ├── 【AUO OCL_FY20 85NB (SSV) 】 SMLD Quality Data Workbook.xlsx
    └── ...

docs
design.png
DevelopManual.html
DevelopManual.md
DevelopManual.pdf
info.text
performance.png
sml_d_db.drawio
sml_d_db.png
SQL.png

lib
├── core.py
├── __init__.py
├── config
│   ├── config.py
│   ├── setname_mapping.py
│   └── __init__.py
├── query
│   ├── query.py
│   └── __init__.py
├── sml_d
│   ├── sml_d.py
│   └── __init__.py
└── utility
```

```
types.py
utils.py
__init__.py
└vba
    caller.py
    SmlWrangler.xlsm
    __init__.py
reports
pmod_sml_viz_v0.09.xlsm
test
cleaned_headers.py
df_replace.py
ext.py
field_names.py
mon.py
```

## Design pattern

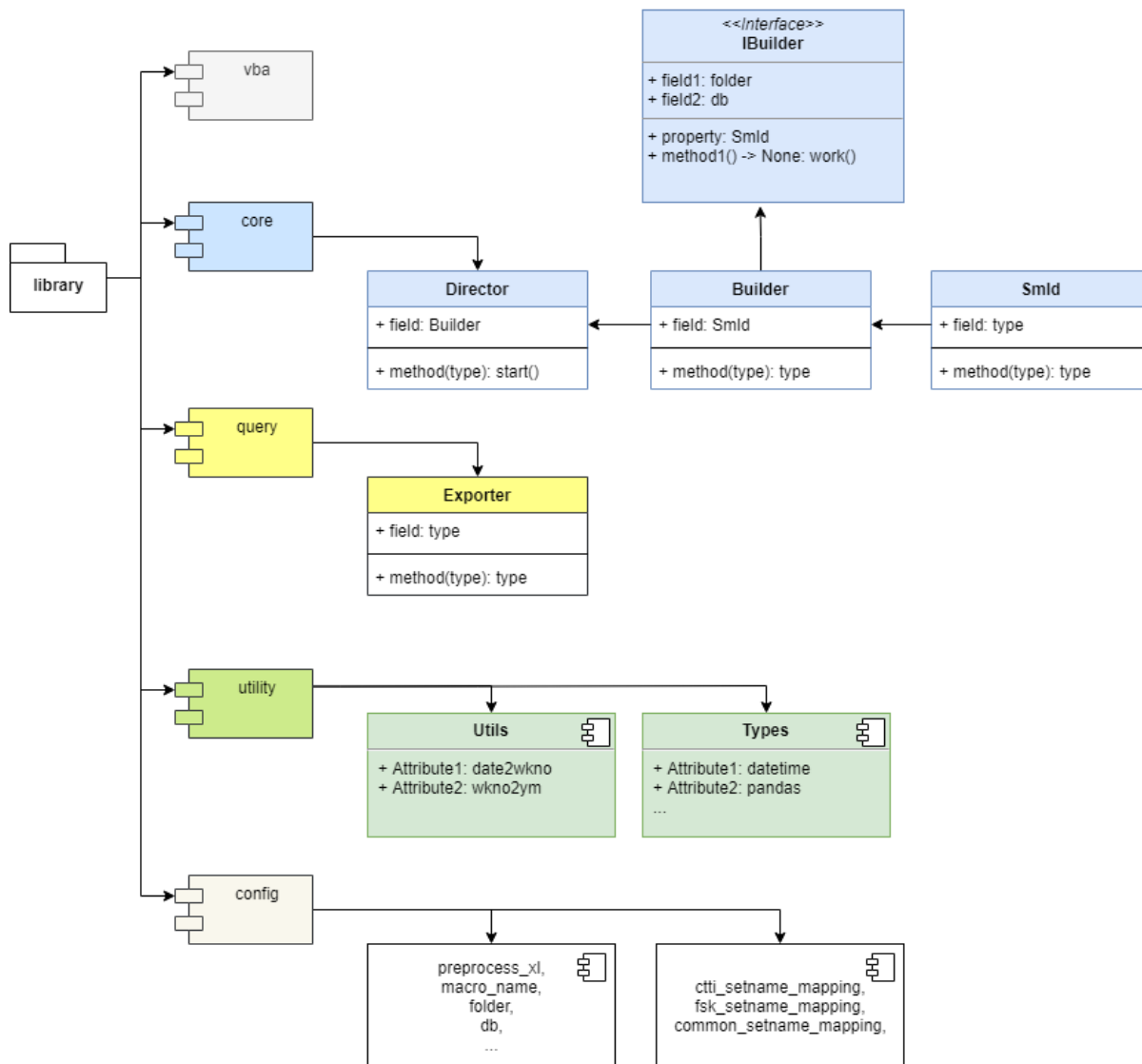
There was an impact to performance when using Python to clean "inputs" data in source files;

After built a VBA class API to preprocess the clean operation, the impact is alleviated;

### Pattern

- (Class) using **VBA** preprocess class API to do basic data cleaning;
- (Class) using **Python + Pandas** to build a DataFrame Merger API to wrangle the preprocessed source files with split control: "defects", "inputs";
- (Class) using **SQL** to control all data entries and poka-yoke duplicate entries;
- (Class) exports **SQL** database to excel "pmod\_sml.xlsx" with unique columns for further data visualization;
- (Module) using **VBA** to visualise pmod sml data;

## Dependency Structure @ZL, 20220107



## Performance

The average run time of whole process is around 3 minutes.

- preprocess : 46.50 seconds
- python->SQL database : 137.16 seconds
- SQL query : 1.19 seconds

=> Performance: 184 seconds

```

== WW Pmod SMLD Control System ==
== powered by @ZL, 20210804 ==
OPEN EDITORS
main.py
logging.info( start preprocess.. )
2021-09-06 09:40:46,752 start preprocess..
2021-09-06 09:41:33,269 Succeeded. time lapsed(s): 46.50
2021-09-06 09:41:33,269 preprocess finished
2021-09-06 09:41:33,269 start Pathon -> SQL
2021-09-06 09:41:33,269 【BOE OCL FY21 75APH APHB (SSVE)】 SMLD Quality Data Workbook.xlsx
2021-09-06 09:41:39,979 【CSOT OCL FY21 75AR (SSVE)】 SMLD Quality Data Workbook.xlsx
2021-09-06 09:41:47,129 【AUO OCL FY21 AG (SSVE)】 SMLD Quality Data W33.xlsx
2021-09-06 09:41:53,969 【AUO OCL FY21 AQ (SSVE)】 SMLD Quality Data W33.xlsx
2021-09-06 09:42:01,443 【CSOT OCL FY21 75AG (SSVE)】 SMLD Quality Data W33.xlsx
2021-09-06 09:42:08,261 FY21 Quality Data SSVE week34.xlsx
2021-09-06 09:42:09,031 【AUO OCL FY20 NH (SSV)】 SMLD Quality Data Workbook.xlsx
2021-09-06 09:42:11,143 【AUO OCL FY21 AG65 85 (SSVE)】 SMLD Quality Data Workbook.xlsx
2021-09-06 09:42:14,080 【AUO OCL FY21 AG (SSVE)】 SMLD Quality Data Workbook.xlsx
2021-09-06 09:42:17,681 【CSOT OCL FY21 75AG (SSVE)】 SMLD Quality Data Workbook.xlsx
2021-09-06 09:42:20,652 【CSOT OCL FY21 75AR (SSVE)】 SMLD Quality Data Workbook.xlsx
2021-09-06 09:42:23,605 【AUO OCL FY20 55, 65NH (SSV)】 SMLD Quality Data Workbook.xlsx
2021-09-06 09:42:30,012 【AUO OCL FY20 85NB (SSV)】 SMLD Quality Data Workbook.xlsx
2021-09-06 09:42:36,152 【AUO OCL FY20 85NX NXB (SSV)】 SMLD Quality Data Workbook.xlsx
2021-09-06 09:42:42,570 【AUO OCL FY21 65AG (SSV)】 SMLD Quality Data Workbook.xlsx
2021-09-06 09:42:48,991 【AUO OCL FY21 85AG (SSV)】 SMLD Quality Data Workbook.xlsx
2021-09-06 09:42:55,097 【AUO OCL FY21 85AX (SSV)】 SMLD Quality Data Workbook.xlsx
2021-09-06 09:43:01,091 【BOE OCL FY20 75NB (SSV)】 SMLD Quality Data Workbook.xlsx
2021-09-06 09:43:06,964 【BOE OCL FY21 75APH (SSV)】 SMLD Quality Data Workbook.xlsx
2021-09-06 09:43:13,181 【CSOT OCL FY20 75NX NXB (SSV)】 SMLD Quality Data Workbook.xlsx
2021-09-06 09:43:19,197 【CSOT OCL FY21 75AG (SSV)】 SMLD Quality Data Workbook.xlsx
2021-09-06 09:43:25,286 【CSOT OCL FY21 75AR (SSV)】 SMLD Quality Data Workbook.xlsx
2021-09-06 09:43:31,406 【CSOT OCL FY21 75AX (SSV)】 SMLD Quality Data Workbook.xlsx
2021-09-06 09:43:37,829 【LGD OCL FY20 75NB (SSV)】 SMLD Quality Data Workbook.xlsx
2021-09-06 09:43:48,791 【SDC OCL FY20 75NX NXB (SSV)】 SMLD Quality Data Workbook.xlsx
2021-09-06 09:43:50,416 SQL update defects completed
2021-09-06 09:43:50,423 SQL update inputs completed
2021-09-06 09:43:50,434 Succeeded. time lapsed(s): 137.16
2021-09-06 09:43:50,590 NumExpr defaulting to 8 threads.
2021-09-06 09:43:51,693 Succeeded. time lapsed(s): 1.19
Ln 50, Col 34

```

## VBA preprocess class API

### Option Explicit

#### Private Sub CPMODWrangler()

```

Dim FSO As New FileSystemObject
Dim srcWB As Workbook
Dim plant As String
Dim rv As Variant
Dim cpw As New CPMODWrangler
Dim subDir As Scripting.Folder
Dim srcFile As Scripting.File
Const tmp_flag As String = "~$"
Const xl_flag As String = "xls"
Dim root As String
root = FSO.GetParentFolderName(FSO.GetParentFolderName(ThisWorkbook.path)) &
Application.PathSeparator & "data"

If root = vbNullString And Not FolderExists(root) Then
    MsgBox "DirNotFound", vbInformation, "NotFoundError"
    Exit Sub
End If

FastMode True
'On Error Resume Next
For Each subDir In FSO.GetFolder(root).SubFolders
    For Each srcFile In FSO.GetFolder(subDir).Files

```

```

        If InStr(srcFile.name, tmp_flag) < 1 And InStr(srcFile.name, xl_flag)
> 1 Then
            Set srcWB = GetObject(srcFile)
            rv = Split(srcWB.FullName, Application.PathSeparator)
            plant = rv(UBound(rv) - 1)
            cpw.init srcWB, plant
            cpw.clean
            Set srcWB = Nothing
        End If
    Next
Next
Set FSO = Nothing
FastMode False
End Sub

```

## Python DataFrame Merger API

Using Python to read all preprocessed files, and clean DataFrame further;

```

def main()->None:
    smld = Smld(
        fix_defects_setname=common_defects_setname,
        fix_defects_setname_mapping=common_defects_setname_mapping,
        fix_inputs_modelname=common_inputs_modelname,
        fix_inputs_modelname_mapping=common_inputs_modelname_mapping,
        fix_inputs_fy=common_inputs_fymod,
        fix_inputs_fy_mapping=common_inputs_fymod_mapping,
    )

    b = Builder(folder, db_web)
    b.smld = smld
    d = Director()
    d.builder = b

    logging.info("start preprocess..")
    try:
        caller.call_vba_macro(os.path.abspath(preprocess_xl), macro_name)
        logging.info("preprocess finished")
    try:
        logging.info("start Python -> SQL..")
        d.start()
    except:
        logging.info("PythonError: failed to merge source file")
    except:
        logging.info("VBAError: failed to clean source file")

    if os.path.exists(db_web):
        ex = query.Exporter(db_web, dst_xl_web)
        ex.work()

```

```
else:
    if os.path.exists(db):
        ex = query.Exporter(db, dst_xl)
        ex.work()
    else:
        raise FileNotFoundError()
```

## Usages

The project itself is a well-tested console application.

### Usage 1

User may utilize **Python** to interact with "pmod\_smld.db";

```
import sqlite3

def dml(db:Path)->None:
    with sqlite3.connect(db) as conn:
        cur = conn.cursor()
        ...
```

### Usage 2

User may write the following **command** to run this application if user is familiar with **Batch**;

Either user may click "main.bat" to achieve same effect;

```
@echo off
cd "root of this project directory"
python main.py
```

### Usage 3

If user was familiar with **SQL**, user should use SQLite3 Studio to link "pmod\_smld.db".

```
SELECT * FROM defects
WHERE TVPlant = "FSK" AND ConfirmationWC = 2132 AND Classify = "Line"
LIMIT 10;
```

## Usage 4

If user was familiar with [Excel](#), user could use Excel application to manipulate data as well;

```
Public Sub load_src()
    ''' load source data from a given workbook @ZL, 20210825
    Dim beg As Single: beg = Timer

    Dim dstWB As Workbook: Set dstWB = ThisWorkbook
    Dim strSRC As String: strSRC = GetFilePath(ThisWorkbook.path)
    If Not FileExists(strSRC) Or strSRC = vbNullString Then
        Exit Sub
    End If
    Dim srcWB As Workbook: Set srcWB = GetObject(strSRC)

    Const wsn_defects As String = "defects"
    Const wsn_inputs As String = "inputs"

    Dim srcDefects As Worksheet, srcInputs As Worksheet
    Dim dstDefects As Worksheet, dstInputs As Worksheet
    If (Not WSExists(srcWB, wsn_defects)) Or (Not WSExists(srcWB, wsn_inputs))
Then
        MsgBox "WSNotFound", vbInformation, "WorkSheetError"
        Exit Sub
    End If

    Set srcDefects = srcWB.Worksheets(wsn_defects)
    Set srcInputs = srcWB.Worksheets(wsn_inputs)
    Set dstDefects = dstWB.Worksheets(wsn_defects)
    Set dstInputs = dstWB.Worksheets(wsn_inputs)

    dstDefects.Cells(1, 1).Resize(srcDefects.UsedRange.Rows.Count,
srcDefects.UsedRange.Columns.Count) = srcDefects.UsedRange.Value
    dstInputs.Cells(1, 1).Resize(srcInputs.UsedRange.Rows.Count,
srcInputs.UsedRange.Columns.Count) = srcInputs.UsedRange.Value

    Const hiddenColumnDefects As String = "V:AC"
    Const hiddenColumnsInputs As String = "G:O"
    dstDefects.Columns(hiddenColumnDefects).EntireColumn.Hidden = True
    dstInputs.Columns(hiddenColumnsInputs).EntireColumn.Hidden = True

    hidde_WS_OldColumns dstWB

    MsgBox "Succesed. time lapsed(s): " & (Timer - beg), vbInformation, "Reload"
End Sub
```

## About

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