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Dissemination Level		
PU	Public	**X**
PP	Restricted to other programme participants (including the Commission Services)	
RE	Restricted to a group specified by the consortium (including the Commission Services)	
CO	Confidential, only for members of the consortium (including the Commission Services)	

Data reconciliation module was developed as part of the overall software tools suite of the EFENIS project. This module is „EFENIS Data Reconciliation". It has been implemented as a macro-enabled Excel Workbook for providing maximum flexibility and familiar interface to industrial users. The module comes with a complete documentation and a guided example.

Using the developed software module is easiest after understanding fundamental concepts as well as the user interface and procedures of „EFENIS Data Reconciliation" software. The following provides instructions how to use it, what is the statistical/mathematical explanation of the working process. To be able to use the program one needs a PC with Microsoft Windows® operation system and Microsoft Office Excel® 2007. Due to the VBA language differences introduced in the 2010 and 2013 versions of Excel®, there will be needed modifications of the code as well to adapt it to the new Excel® versions.

System requirements

For users running 32-bit operating systems, the 32-bit version of Office 2010 is compatible with Windows 7, Vista with SP1, XP with SP3, Server 2008, and Server 2003 R2 with MSXML 6.0. For those running 64-bit operating systems, the 32-bit version of Office 2010 is compatible with Windows 7, Vista SP1, Server 2008 R2, Server 2008, and Server 2003 R2 with MSXML 6.0. The 64-bit version of Office 2010 will not work on Server 2003 R2 with MSXML 6.0.

Processor Required
- 500 MHz or faster processor

Memory Required
- 256 MB RAM; 512 MB recommended for graphics features, Outlook Instant Search, and certain advanced functionality

Hard disk
- 3 GB available disk space

Display
- 1024 x 576 or higher resolution monitor

Operating system
- Windows 7, Windows Vista with SP1, Windows XP (must have SP3) (32-bit), Windows Server 2008, Windows Server 2003 R2 with MSXML 6.0, or later 32- or 64-bit OS

Other requirements.

Microsoft Excel Solver has to be referenced before using the program.
1. Click the **File** tab, and then click **Options** below the **Excel** tab.
2. In the **Excel Options** dialog box, click **Add-Ins**.
3. In the **Manage** drop-down box, select **Excel Add-ins**, and then click **Go**.

4. In the **Add-Ins** dialog box, select **Solver Add-in**, and then click OK.

Secondly, Solver has to be referenced within the Visual Basic Editor.

1. Press **ALT+F11** to open VBA Editor.
2. Click the **Tools** tab, and then click **References**.
3. In the **Available References** box, click **Solver** then click OK.

This software can reconcile measured values of a production environment and can remove some measurement errors. The program takes into account every result of the last measurement period and determines the true value of the measured values on the basis of their potential. It is important to know that the program assumes steady state of the underlying process. This means that the measured parameters have to move around a given constant value. If there is too much difference in the measured values, the user has the opportunity to remove these values based on a statistical method and perform the recalculation without those parameters.

The program can theoretically be used for 100s of input and output flows (parameters). Of course the calculation time increases with the number of parameters. The user has to provide the raw data. Please take into consideration that the input and output measurements (columns in Excel) should be equivalent. Otherwise the program prompts an error message.

There are two different ways to reconcile the measured data:

- reconciliation of *mean* values
- reconciliation of the *last measurement* values

If the user clicks on the first alternative the program will calculate covariance matrix, corrective vector etc. regarding to the mean values. In other case the program will calculate based on the values of last measurement. No matter what the user choses, the calculation process remains the same.