Objective:
The objectives of this project are to improve and verify the paraffin deposition model, and to maintain and improve TUWAX Software.

Project Description:
TUPDP data and data available in literature will be used to build the TUPDP data bank. The databank will be used for the up-scaling study. An analysis on the relationship between the heat transfer, Reynolds number, and shear stress on the deposition will be performed. Two up-scaling approaches will be studied. These two approaches are the up-scaling of the prediction by (1) using the empirical correlation and (2) using the model closure relationship. These up-scaling studies will include the up-scaling of the deposit thickness and wax fraction predictions.

The incompatibility between MSI-TUWAX and Excel-TUWAX with Windows 7 and Excel 2010 will be fixed. The bug-free version of MSI-TUWAX and Excel-TUWAX will be delivered at the end of *Phase IV*. In *Phase V*, the current TUWAX will be upgraded to a new version. The new version of TUWAX will be able to take the fluid properties input from various sources including the experimental data, PVTSim, MSI-TUWAX, and other commonly used software. It will be written in a modular fashion. Each part of the new version of TUWAX can be updated individually. Moreover, this will allow the deposition calculation module to be integrated into other commercial software, i.e. OLGA, at a later date. The schematic describing the features of the new TUWAX is illustrated below in Figs. 1 and 2.

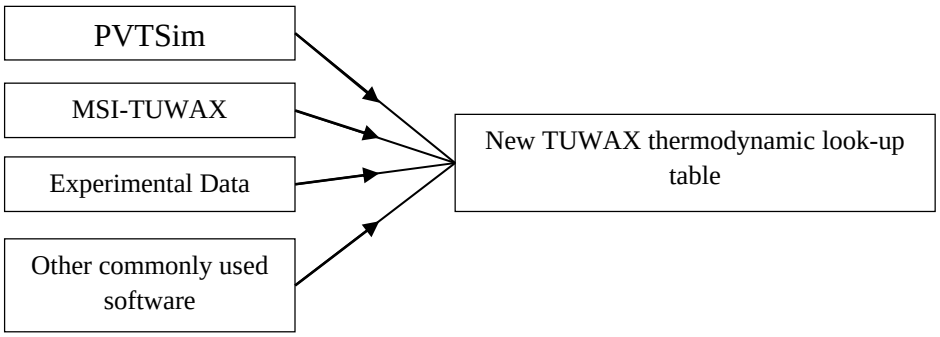

Figure 1: New TUWAX will be independent from the MSI-TUWAX thermodynamic package. User can select the thermodynamic input from PVTSim, MSI-TUWAX, Experimental Data or other thermodynamic software.

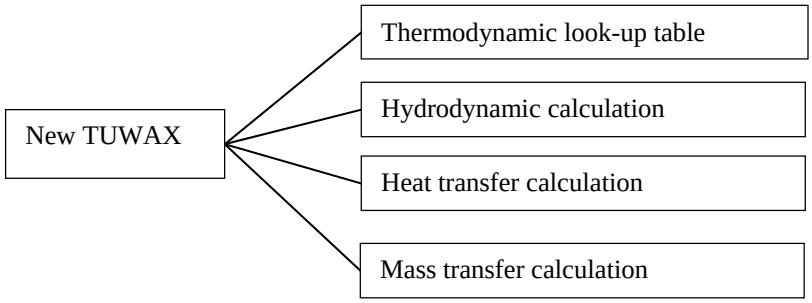

Figure 2: Modular structure of New TUWAX

The existing Panacharoensawad (2012) Fortran code will be incorporated into the new Excel-TUWAX. This source code includes the Lee (2008) wax deposition model, the adaptive time step (Runge-Kutta-Fehlberg 45) procedure and the gradient descent method to search for the fitting parameter. The Levenberg-Marquardt subroutine will be incorporated into TUWAX to improve the fitting parameters finding subroutine of Panacharoensawad (2012). This new subroutine is ten times faster than the gradient descent method. It allows for a multiple parameters fitting. Karami (2011) wax deposition prediction will be coded and incorporated into the new version of TUWAX.