MANCHESTER 1824
The University of Manchester

STAR enhancements

This document lists STAR release enhancements and resolved issues by version, with the most recent changes shown first. It is intended for STAR users, support staff, and developers who need to identify what changed in each version and whether a change affects existing models, reports, or workflows.

For changes that are not specific to a single STAR program area, review the General enhancements.

Version 2.9-160 (08/06/2026)

- The input data table reports have been enhanced to display all data and can now be copied to Excel with correct alignment.
- The zoom slide control in the flowsheet environment has been changed from a linear scale to an exponential scale. This gives a more intuitive response.

Version 2.9-157 (18/05/2026)

- The pictographs in the flowsheet can now be resized. This can be used to highlight specific elements in the flowsheet.

Version 2.9-156 (28/10/2025)

- The stream data editor–Excel interface became unstable in some situations.
- Paste Stream and Paste Stream New in the Stream data editor could corrupt stream data in some circumstances.

Version 2.9-155 (17/02/2025)

- The emission targeting functions have been rewritten to access the internal steam tables, removing the need for users to specify steam properties manually.
- Emission limits and cost have been added to the utility placement optimisation.
- An issue in the steam network simulator DOF calculation for temperature-controlled letdown specifications has been corrected. This correction may prevent some existing simulation files from simulating until their specifications are updated.
- The multiple utilities placement objective has now been expanded to include total cost and minimum COx emissions
- Fired heater have been added to the steam system simulator environment. These are devices that consume fuel and produce emissions. Thay can be linked to operation units to vary the required heatload if required.

Version 2.9-154 (21/12/2024)

- The steam turbine mechanical efficiency was not applied consistently in the simulator and optimizer leading to differences in the optimization and simulation results. This has been resolved
- There was an inconsistency between the deaerator model used in the simulator and the optimization formulation. The simulator used an overall energy balance to determine steam and demineralized-water requirements, while the optimization used an overall flow balance and an inequality for the overall energy balance. This meant the steam-flow and demineralized-water-flow trade-off was determined by

the objective function, such as minimum operating cost. The optimization now uses an equality for the overall energy balance, giving consistent results in the simulator and optimiser.

- In some circumstances, the NVP of a gaseous fuel was not being updated correctly in the editor. This has been resolved
- The entity title on the flowsheet can now be positioned and scaled
- The entity drawing attributes can now be modified from the entity editor
- The ability to add notes to the network entities has been implemented
- The stream data editor display colours can now be user specified, addressing accessibility issues reported by a colour-blind user.
- A power station model has been included in the steam simulator. A power station is any self-contained unit that generates electrical power and may consume fuel. It is currently assumed to run at maximum capacity with constant power output. The power is included in the overall site power balance, and, if a fuel is specified, the fuel is included in operating cost and emissions calculations.

Version 2.9-153 (09/11/2024)

- In some circumstances, the fraction of BFW from a deaerator to a given user (Boiler, HRSG, Steam generator, Letdown, or Steam user) was not updated correctly when a new deaerator was added. This has been resolved.
- The deaerator flowrate balance during optimization will have issues if the condensates return and feed steam flowrates were significantly greater than the BFW demand
- The help text has been revised to clarify how the electrical transmission efficiencies are applied to the network.
- In some circumstances steam users that are specified as “by flow balance” or exports without the flowrate specified would not calculate the enthalpy change. This has now been resolved.
- Boiler fuel index was not being assigned correctly during case copy and paste operations. This has been resolved
- The electric boiler pictogram has been revised
- An issue with the electric boiler editor not making the steam main flowrate field available correctly has been resolved.
- Under some situations the internal value of the boiler and HRSG main outlet pressure and temperature would be determined incorrectly. This has been resolved
- In some situations, the DOF analysis would fail to correctly identify that a export steam user flowrate had been specified. This has been resolved
- The power and capital contribution of gas turbine were not correctly incorporated into the simulation reports leading to issues in the overall power balance and operating cost
- There was an error in the reported demineralized water cost in the simulation report, and it was missing from the optimization difference report.
- A feature has been included to add the virtual BFW and condensate connection in the flowsheet if a deaerator has been specified. See PFD\PFD Options\Misc\add auxiliary connections

Version 2.9-152 (12/09/2024)

- A facility has been included to determine the correct de-aerator steam flow rate estimate for a given network.

- Under some circumstances it was not possible to create the first steam main. This has been resolved
- THE HRSG editor was not un-greying certain parameters under some circumstances. This has been resolved
- The HRSG did not correctly update the supplementary firing heatload when updating the simulation with the optimized results. This has been resolved
- Capital cost for de-aerator, flash stream recovery and de-mineralized water are not reported in detail and correctly considered in the network optimization.
- A retrograde issue with “bottom up” DOF calculation order has been resolved
- In some circumstances, the flash recovery unit reported the inlet temperature rather than the outlet operating temperature. It now reports the outlet operating temperature consistently.

Version 2.9-150 (20/05/2024)

- In some circumstances the NVP of a gaseous fuel was not being updated correctly in the editor. This has been resolved.
- The entity title on the flowsheet can now be positioned and scaled.
- The entity drawing attributes can now be modified from the entity editor.
- The ability to add notes to the network entities has been implemented.
- Air cooled stream condensing mains have been incorporated.
- That auxiliary power requirements for boiler and HRSG were not correctly incorporated into the overall electrical power balance
- The colours and shading method have been enhanced for the flowsheet editors.
- The network steam mains can now have case dependent operating pressure.

Version 2.9-148 (18/09/2023)

- A power station model has been included in the stream simulator. A power station is any self-contained unit that generates electrical power and may consume fuel. It is currently assumed that it runs at maximum capacity. (Constant power output). The power is included in the overall site power balance and if a fuel is specified then this is included in the operating cost and emissions
- In some circumstances the fraction of returned condensate to the deaerator would be incorrectly calculated. This has been resolved.
- Cooling water demand for processes and power stations have been incorporated.
- An issue relating to steam user demands when linked to a process capacity has been resolved.
- The ability to add notes to all the major units has been included to aid documentation.
- Boilers can have a temperature and pressure drop specified for each of the outlet pressure levels. This is to handle the situation where there is a significant loss of pressure and temperature between the boiler and the steam main.
- Some of the default pictogram colours have been harmonized to make the function of the item more intuitive.

Version 2.9-146

- The stream outlet temperature for steam generating devices (Boiler/HRSG/Steam generator) can now be optionally specified by the steam main nominal temperature
- The boiler and HRSG editor have been revised to make it easier to specify the flue gas profile
- Some of the flowsheet pictograms are now configurable (Steam mains, Letdown, De-aerator, Process) to assist in visually identifying network items in large networks
- The stream data can now be filtered by temperature or zone to permit subsets of stream to be targeted

- A new steam main display icon “Manifold dynamic” has been implemented. The icon re-sizes to accommodate many connections and connects the links directly to the manifold rather than to a single point. This can improve the overall layout of the flowsheet in complex networks
- An option has been added to permit users to base the line types on the steam network simulation flowsheet base on the properties on the connection (i.e. Flowrate, Pressure). An example of this maybe flowrate where the relative size of the connection flowrate can be indicated by either assigning a different colour to each flowrate range or the same colour maybe used but different line thickness may be specified to give a visual indication of the relative magnitude of each connection
- Under certain combinations of deaerator specification for the stream generators, the demineralised water requirement for the specified deaerator was being reported as less than zero. In this situation the demineralised water requirement is set to zero

Version 2.9-145

- Some of the capital cost values in the driver selection report were incorrect for parallel systems
- Some issue relating to the User Excel report data transfer have been resolved
- The steam turbine mechanical efficiency was not being applied consistently in the simulation and optimisation formulation
- The “Revert” function word correct the steam network connectivity when in combined icon mode
- An issue relating to the optimisation formulation for HRSG fuel requirement has been resolved
- The steam network DOF failed to correctly identify non calculated Flash Steam Recoveries (FSR) when determining steam main flow balances. This has been corrected. This may affect the DOF analysis for existing simulation models
- The Boiler model specification “Flue gas and fuel heatload - Calculate steam flow” was not correctly determining the correct steam flow. This has been corrected
- An electric boiler model has been implemented. The electrical demand is included in the site electrical power balance.

Version 2.9-144

- Issues relating to small temperature difference on stream segments have been resolved in process and site targeting sections
- The steam network report now gives more details on stream properties
- The were issue with the “Identify” tool return incorrect properties for connection to flash recovery units
- The individual process loads reported in site targeting were incorrect.
- The Site target sink profile was incorrect for monotonic stream levels
- The HTML version of the steam flowsheet simulation report had been enhanced with links to enable easier navigation.
- An issue relating to the steam turbine power correlation based on “internal correlation – Tsat based” has been resolved. In general, previously it would overestimate the power obtained from the turbine.
- The steam turbines based on the internal correlation models can now be specified as “new” or “existing”. The “existing” model is equivalent to the previous versions and uses the specified maximum flow to determine part load performance. The “new” model sets the maximum flowrate to be a scale factor of the current flowrate

(maximum usually 120% of current flowrate) . This ensures that the “new” model performance is at a higher efficiency.
- The “machine efficiency” and “power correction” has been revised to give consistent result across all turbine specifications.
- Issue relating to the deletion of data records in the regression editor have been resolved.

Version 2.9-142

- New Development environment libraries
- Restructure on-line help
- An issue relating to the pinch range targeting feedback window has been resolved
- An issue relating to the pinch range targeting report (no utilities) has been resolved
- The steam network unit “operation” has been renamed to “process” and the default icon attribute have been revised. A “Steam process” is now referred to as “Steam user”
- Icon attributes for Processes, Steam User and Steam Generators can now be individually specified

Version 2.9-141

- The existing correlations for industrial and aero-derived gas turbines were designed to work over a wide range of shaft power outputs, but they gave low efficiency values for small machines. Additional correlations have been added to represent machines over specific ranges and give a better representation of expected actual machine performance.
- An issue in the flowsheet treeview tool has been resolved
- An issue with the text for the Gas turbine calculator has been resolved
- The simulation report for steam turbine has been revised to differentiate the information for the stage and the outlet connection.
- The on-line help has been revised to clarify how the maximum stage flowrate is determined which is required for a Willans’ based power model.
- The stream turbine internal power correlation for pressure-based system was incorrect for condensing machines giving misleading results. This has been corrected. Also, a check is now made to ensure that the condensing main pressure is low enough to give meaningful results.
- An issue relating to connecting flash recovery outlets has been resolved
- An issue relating to flash recovery inlet temperature when connected to a HRSG has been resolved

Version 2.9-140

- The compressor driver selection functionality from the WORK software has been incorporated.
- An input units’ class for NOx conversion data has been added
- Internal restructuring for input dialogues and reports to maintain consistency
- An issue excel interface for the steam network has been resolved
- Boiler/HRSG outlet steam mins are now sorted into descending pressure order
- Boiler/HRSG can now have regeneration stream
- Multiple issues with ancillary cost terms not being include in simulation /optimisation

Version 2.9-136

- Boiler and HRSG units can now accept specification for pumping and auxiliary power. This power can be from electrical motors or driver steam turbines
- Electric motor and electrical power generation now have conversion efficiencies applied
- User dialogues revised to high differences between shaftwork and electrical power
- Options have been added to the steam network unit to permit how icon are displayed and greater control on the display of operating data on the flowsheet
- Gas turbine flowsheet pictograms now differentiate between power and driver specification
- A temperature loss can be specified for a HRSG duct
- The simple Gas turbine model was inconsistent when applying casing losses. This has been resolved
- An issue with the steam turbine editor power model selection has been resolved

Version 2.9-134

- Boiler feed water users can now specify a temperature drop of the BFW from the de-aerator conditions into the unit
- The Boiler efficiency setting was not read correctly from the project file. This has been resolved
- An issue relating to the flowrate balance for cascaded flash recovery units has been resolved
- An issue relating to Gas turbine default correlation initialisation has been resolved
- Site configuration power efficiencies were not saved correctly to data file. This has been resolved
- Process element with ID=0 was incorrectly checking for a matching operation unit. This has been resolved.

Version 2.9-133 (14/8/2018)

- The Excel interface for the steam network has been revamped to include the latest enhancements
- Capacity contingency has been extended to include imported steam and power and gas turbine power

Version 2.9-132

- An issue relating to steam driver turbine not meeting their load specification during optimisation has been resolved
- The way Operations are linked to other network elements (steam users, generator, steam driver turbine, etc.) is now achieved using process ID numbers rather than network connections
- Deaerator steam flowrates were not being updated during optimisation. this has been corrected
- Operating contingency and failure analysis has been implemented for electrical power and stream flowrates into the steam network optimisation formulation
- Various issues relating to steam network optimisation limits for individual elements has been resolved

Version 2.9-131 (1/5/2018)

- The gas turbine database performance plot did not have the correct unit conversion applied. This has been corrected
- The trend correlation in the Gas Turbine database plot has which were originally from the standalone gas turbine model have been re-worked to more accurately reflect the data in the database. The trend correlation values are given in the on-line help
- The default internal correlations used for the “Industrial” and “Areo-derived” gas turbine models have been revised in-line with the gas turbine database
- Issue with the grey controls on the stream turbine editor has been resolved
- Capacity contingency has been added to the Steam network optimisation. This permits the inclusion of spare operating capacity in the network to readily respond to equipment failure.
- Issues relating to boiler and HRSG flowrate limits with multiple steam outlets in the optimisation have been resolved.
- Gas turbine active flag did not initialise correctly. This has been resolved
- The default optimisation bounds for steam imported from a Stream Generator were incorrect. This has been resolved.
- Some issues relating to the summary difference reports for multiple operating case examples have been resolved.
- Some issues relating to the HRSG editor have been resolved
- Where appropriate all temperature, pressure, flowrate and fraction input values now have input bound imposed by default. See General enhancements more details.
- The variable boiler efficiency for boilers with multiple outlets was applied differently in the simulator and optimiser. This has now been made consistent. See on-line help for more details
- Fuel data is now specified on a per “case basis”. This can be used to implement cases with different fuels or tariffs
- Stream pricing and stream cost sensitivity can now be performed from the stream network environment
- A new optimisation formulation has been added to permit users to examine the effect of equipment failure on the network optimisation
- An overall water balance report has been added to the steam network simulation report
- The Deaerator units now uses the maximum of the steam requires and the steam supplied when determining the flowrate balance
- An issue with the HRSG blowdown to a flash unit using the incorrect flowrates has been resolved
- An issue relation to how imported BFW was allocated to Boiler/HRSG when devices were deactivated has been resolved
- Issues relating to the utility editor with emission association has been resolved
- The on-line help have been enhanced to cover the new features and flowsheet editor in more detail
- Incorrect limits were being imposed when an Operation was linked to a steam user/generator. This has now been corrected

Version 2.9-130

- The optimisation formulation failed to correctly identify condensate return from process and hence the deaerator energy balance we incorrect
- The summation of the total power was incorrect in the steam system optimisation difference report
- An issue with the gas turbine correlation editor has been resolved

- An issue with the total site composite in iso-thermal mode using an invalid VHP steam value has been resolved

Version 2.9-129

- Under certain circumstances the steam simulator would incorrectly calculate the stream mains operating temperature. This was related to the upgrade to permit system to be solve when the stream main feed was at uniform temperature. This has been resolved.

Version 2.9-128

- Boiler and HRSG steam flow specification were incorrectly being applied when other specifications stated that the flowrate should be calculated.
- An issue with the gas turbine database trend plot has been resolved
- Steam main can now be "chained" together. These stream main act as a single uniform main but can be used to simplify the steam flowsheet connection in large network by eliminating the need to have all the steam users connected to a single pictogram.
- Sorting the stream mains in the site targeting section would corrupt an existing stream network. This has been resolved.

Version 2.9-127

- An issue with flash stream liquid being returned to the de-aerator has been resolved
- The size of the input dialogue boxes for the network operation "names " and "find" has been increase and standardised
- Top Level Analysis functions (TLA) have been removed are their technology has been superseded by Steam Network Optimisation and Steam Pricing facilities.
- Dropdown menu s can now be configured for either "Long" or "short" menus. Some of the longer menus have been re-worked for smaller resolution display devices. Less frequently used functions are now in fly-out sub menus.
- The stream network simulator has been enhanced to identify when a steam main if supplied at constant temperature. Driver turbines require that the steam main temperature is known before the flowrate can be calculated. This permits inlet flowrates to the main to be a DOF when driver turbine as supplied by the main
- The steam network optimiser formulation got corrupted with multiple temperature-based boilers when some were deactivated. This has been resolved
- An issue with imported boiler feed water being returned to the deaerator causing a mass and energy balance imbalance has been resolved

Version 2.9-126

- The utility data now has a direct interface to excel to permit bi-directional data transfer
- The clipboard data interface has been revised to include the "linked" utility information
- Issues relating to the reports for the deaerator and condensate flow allocation have been resolved.
- Driver turbine units have a new operating mode included to permit the steam turbine and electric motor to operate together. The load on the electric driver can be specified. The flowsheet optimiser has been enhanced to determine the suitable combination of steam driver and electric motor load. A new flowsheet pictogram has been included to represent the new configuration

- Capital cost element has been included for Electric motors, De-aerator units and Flash recovery units
- Power conversion efficiencies have been included for electric motors and de-aerator pumps
- Process boiler feedwater demand can now be specified
- Multiple demineralised water units can now be specified
- De-aerator condensate return temperature can now be specified for each de-aerator, Steam user, Flash recovery units and steam mains
- Flash recovery units' liquid outlets can now be lost to the environments or sent directly to a specified de-aerator.
- Steam mains can now consider both flowrate and heat losses

Version 2.9-125

- Nomenclature is now displayed in the simulation report explaining the bound violation indicators. This nomenclature can be switched off in the simulation report options.
- An issue relating to condensate energy calculation when no de-aerator has been specified has been resolved.

Version 2.9-121

- An issue with the boiler editor "find" dropdown has been resolved
- Boiler efficiency can now be specified greater than 100%
- An issue with the unit's conversion on the fuel edit has been resolved
- Volumetric unit as standard conditions are identified with a (N) or (s)
- An issue with GT casing loss not being applied consistently has been resolved

Version 2.9-120

- Gas turbine performance can now be linked to operation capacity
- Issues relating to DLL versions in the installation scripts have been resolved
- Total site targeting has been enhanced to permit mis-matched source-sink profiles especially in retrofit situations using user selectable slack variables
- Report function has been revised to include some unreported import data
- Issue relating to the steam profiles generated from stream tables having insufficient temperature difference between wet and dry saturation points have been resolved
- Online Help for site data extraction has been revised
- Issue relating to gas turbines selected from the gas turbine database always been inactive have been resolved
- Help text relating to capital cost correlation basis has been corrected (1996-> 2008)
- Various input form layout has been adjusted to be compatible with lower resolution displays
- Total fuel energy used added to reports
- The ability to specify the condensate outlet temperature for steam user have been incorporated
- Gas turbine can now have a "casing loss" specified to manage the amount of heat in the exhaust fluegas
- The demineralise water temperature can now be specified on an individual de-aerator basis

- Issue relating to data corruption in the fuel editor has been resolved. The fuel editor now displays the unit cost of energy for each fuel
- Issue relating to the steam flowsheet not refreshing correctly in certain situation has been resolved
- Regression tools have been added for Gas Turbine/Steam Boilers and Steam Turbines. This can be used to generate performance correlations to be used in the steam network simulator/optimiser. They can be used in stand-alone mode or as part of the specification of device in the network
- Steam turbine defaults and Gas turbine type description have been enhanced
- Multiple de-aerators can now be specified. Each BFW users (Boiler/HRSG/Steam generation etc.) can now specify the proportion of BFW supplied from each de-aerator. If the overall proportion is less than unity, the difference is supplied by imported BFW. For each of the source of returned condensate (steam user/condensing mains) the proportion of flow to each de-aerator can be specified
- Simulation reports enhance to give detailed information to BFW, and condensate flows for each relevant device
- Issue relating to incorrect cooling water cost in the reports have been resolved.
- The definition of "single case" behaviour in a multiple case project has been clarified

Version 2.9-117

- Gas turbine model revised and updated
- Issues relating to minimum flowrate specification stopping steam driver turbine exploiting electric motors has been resolved
- Steam network optimisation formulation modified to force HRSG to shut down if feed GT is switched off
- An issue relation to multiple cost laws not been correctly /saved/read for the data file has been resolved
- Online help enhanced for Boiler/HRSG thermal properties and TH profile information
- Process area target now reports process and utility area usage

Version 2.9-100

- An issue relating to the steam user model when de-superheating exploited has been resolved
- Issue relation to the capital cost term in the editor for boiler and steam turbines has been resolved
- Issue relation to steam bleed heating have been resolved
- Issue relation to the flow sheeting colour configuration have been resolved
- User definable excel report added
- A new power model has been added for steam turbine
- NOx emission now based on "per machine" rather than fuel usage
- Excel interface for all flowsheet information has been included
- A database of publish gas turbine performance has been added
- Site targeting – an error which added additional fuel to the site target to compensate for power generation has been corrected. The energy for power production comes for internal energy due to pressure change
- On-line help upgraded to cover new features
- Emission targeting has been revised and updated
- An issue relation to incorrect unit's conversion on the steam simulation report has been resolved

- Issues relating to GT/HRSG calculations has been resolved
- Site targets based on non-isotherm steam mains data and power targets based on network simulation have been implemented
- Driver turbine would sometime be ignored in the network simulation. This has been corrected
- Flowsheet feedback value now has suitable units added
- Additional information in flowsheet relation to pressure has been implemented
- Increased feedback on flowsheet connectivity
- A simple gas turbine model has been implanted relating power to fuel by a simple efficiency
- Where possible data it now checked on closing an editor to permit data specification conflicts to be resolved. “verify” functions added to editor to assist user detect conflicts
- Marginal steam costing implemented
- Steam network cost sensitivity to steam and power tariffs implemented
- Data editors enhanced to permit closure using the ESC key
- An issue relation to HRSG using incorrect data during optimisation has been resolved
- The flowsheet can now be shaved to a file for including in reports etc.
- Option added to exclusion emissions calculations to simplify simulation, optimisation and reports
- An option to exclude slack variable from the steam network optimisation has been implemented
- Options added to hide data “noise” (small non-zero values) in reports
- The fuel editor was having issues with the gas/non-gas data update. This has been resolved
- The flowsheet “Treeview” now stores branch open and close settings
- Fuel using added to process “operation” to handle any fuel used as feedstock or local utility usage (i.e. fired heater)
- Issue relating to flash steam recovery pressure drop has been resolved
- A steam turbine performance utility has been implemented
- Flowsheet pictogram modified such that they all use the same light source location for shading
- Issue relation to minimum flowrate through section of a multi-section steam turbine has been resolved
- Flowsheet icon colours have been rationalised and enhanced
- A hot key (Alt+R) to switch between new design and retrofit economics mode has been implemented
- Site targeting has been enhanced to include retrofit profile matching
- Site file data editor upgraded
- Process operation reports upgraded to contain fuel and emission information
- Driver turbine can now have their load “linked” to process capacity (i.e. feed pumps etc.)
- Issues relation to the steam network simulator DOF analysis have been resolved
- Issues relation to HRSG supplementary firing limits with multiple fuels has been resolved
- Multiple fuel and power tariffs can be specified
- Steam network optimisation issue relation to driver electric motor activation has been resolved
- Icon added to flowsheet to visualise when driver turbine is using an electric motor

Version 2.9

- An issue relation to machine efficiencies in the steam simulator power calculation has been resolved
- Obsolete data items removed from HRSG editor
- Boiler editor issue resolved

Version 2.8

- Editor upgrade to permit sorting od data element based on process IDs

Version 2.1

- An issue with site retrofit data not being updated correctly in the editor has been resolved.
- An issue with HRSG fuel data becoming corrupt has now been resolved.
- Process steam generators and boilers can now have flash steam recovery applied to the blowdown stream.

- An issue with site targeting crashing has been resolved.
- An issue with steam system report not correctly reporting BFW loads and boiler energy balances.
- An issue with the A & B Wilan coefficient for the internal model has been resolved.

- Process steam load can now have flash steam recovery applied to the blowdown stream.
- An issue with site retrofit data not being updated correctly in the editor has been resolved.
- Steam network report enhanced to identify BFW preheat loads.
- Feedback improved in the steam network flowsheet
- The DOF analyser for the steam simulator has been enhanced to identify a greater range of topologies.
- An issue Gas turbine capital cost not been correctly converted with internal currency unit changed has been resolved.
- An issue with site level optimisation crashing has been resolved.

Version 2.0

- Function added to the site data extraction tool to include local utilities and temperature limits.
- An issue with site data extraction has been resolved.
- Site data files file now based on true temperature with any minimum approach temperature been specified as a local DT contribution.
- A tool to convert stream data to sit data has been implemented.
- Isentropic efficiencies can now be specified for each stage of a multi-wheel machine.
- Flash steam recovery, de0aerator units and multiple process load/generators have been implemented.
- A data regression tool for steam turbines has been added.
- An issue with inactive steam turbine being included in the optimisation been resolved.
- An issue with data extraction and non-default conversion units has now been resolved.
- The internal steam model now assumed a default Wilan efficiency of 0.833 for the internal correlations.
- An issue with the utility range report resolved.
- An issue with the calculation of process load in the steam network has been resolved.

Version 1.8

- Steam turbine model now consistently applied the Willan's correlation to the extraction rate not the inlet rate
- Steam simulator - annual connection charge now case dependent.
- The loss coefficient on multistage steam turbine is now distributed according to the maximum potential shaftpower in a given wheel
- Import/Export facility added to steam network mains.
- Steam turbines can have individual inlet conditioning (Dp & Dt)
- Condensate cooling water load now correctly calculated, costed and reported.
- A problem with the GCC pocket removal (Data Extraction) has been resolved.
- Data import/Export function now correctly handles segmented streams.
- Utility linking can now include non-equality constraints

Version 1.7

- Steam network simulator has had numerous minor updates especially in the area of boiler efficiencies, blowdown energy balances and boiler feed water requirements.
- Driver turbines added
- Steam turbines can have minimum /maximum power production specifications
- Boiler blowdown can now be specified as a proportion of outlet flowrate
- Multiple fuels per boiler added
- A problem with connecting boiler to steam main in the PFD has been corrected.
- A problem with calculating steam main operating temperature has been corrected.
- The Steam simulation system can now analysis multiple operating conditions

Version 1.6

- Steam turbine model can now use user definable regression coefficient for the shaftpower calculations.
- Multistage steam turbines can be decomposed using with a parallel or series (default) model.
- Capital cost information has can now be specified for stream turbines and boilers.
- Steam turbine enthalpy balances now correctly incorporate the losses.
- Steam turbines can now have a constant isentropic efficiency model specified
- Problem with spurious error messages about missing .SIT files and site range calculations problem have been resolved.
- Point and Range menu incorporated into Targets menu
- Sub-ambient targeting (exergy) and design function (refrigeration) incorporated into new **WORK** package

Version 1.5

- HRSG DTmin editor actually changing the ambient temperature. This has now been resolved
- Gas turbine calculator would behave erratically if the flowrate unit was not in the default unit [t/h] . This has now been resolved.
- Capital cost editor not showing correct value of "C" coefficient when non-unity currency unit conversion was used. This has now been resolved.
- Wrong unit conversion applied to flow CP in site configuration report. This has now been resolved.
- Utility streams may now be specified using steam properties

- Refrigeration Systems: A new facility has been added to analyse low temperature systems.
- Complex Refrigerant Systems: Design options for refrigeration systems which involve multiple levels, economisers, pre-saturators, intermediate heat rejection and sub-cooling can now be analysed.
- Mixed Refrigerants: A facility for mixed refrigerants allows the composition to be optimised.
- Graphical Display: A new graphical display has been added for low temperature systems.
- The Master file (.MAS) has been merged with the SDF file providing a uniform interface. Import and export facilities have been provided from backwards compatibility.
- A steam system simulator and optimiser have been added. The optimisation is aimed at the operational aspects rather than design. The steam network is defined using the interactive graphical interface.
- The power output from steam turbines can now be determined using internal Willan's correlations rather than user supplied data
- The steam tables interface has been improved.
- Stream data may be transferred to/from a spreadsheet program via the clipboard.
- The Site grand composite curve has been added to the site utility grand composite curve to highlight appropriate steam levels.
- Enthalpy values in stream/site data report not now apply the correct unit's conversion function

Version 1.4

- Due to the increasing functionality of the program the main toolbar has been made user configurable.