



SOFTWARE



Leak

Release Notes for Version 3.3

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Leak v3.3 Release Notes

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New Features and Major Enhancements in Leak v3.3

Leak version 3.3 has primarily been developed to support Windows Vista and Windows 7 operating system environments.

Please refer to the installation instructions for details of the installation and licensing process.

Details of the new features introduced in Leak version 3.2 have been included in this document, below as this update is a functional update for operating system support. All of the new features included in version 3.2 remain available in version 3.3.



New Features: Major Enhancements v3.2

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New Features: Major Enhancements v3.2

New Analytical Function

A revised analytical function has been implemented together with revised coefficients in the new version of Leak v3.2. The new leak frequency equation illustrated below and new coefficients were derived following analytical work carried out by DNV Energy consultants¹. DNV Energy revisited and analysed the UK Health Safety Executive's (HSE) Hydrocarbon Release Database (HCRD) in the context of the Leak program:

$$F(d) = C(1 + aD^n) d^m + F_{rup}$$

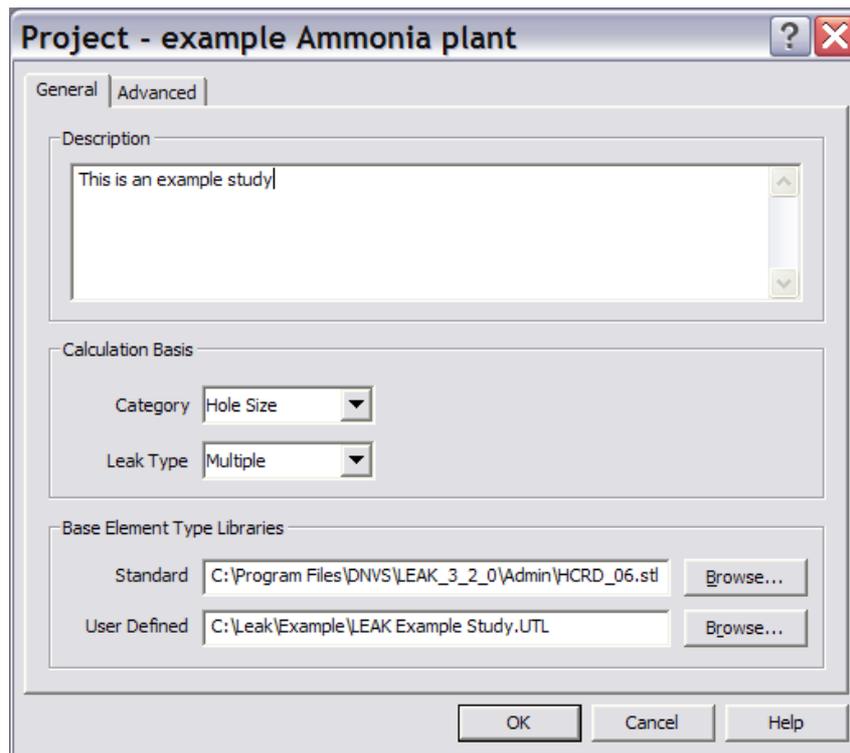
Using separate parameters C , a , n , m and F_{rup} this formula is used to calculate the frequency as a function of leak size (or release mass flow rate) for the Continuous Base Element Types (or Base Types). The discrete format for leak frequency data uses a table, which gives the frequency for a range of hole sizes.

A new Standard Type Library (STL) file containing the updated failure frequency data for the common Base Element Types is provided.

The *.STL provided with Leak v3.2 is based on historical release frequencies experienced on offshore installations in the UK waters which have been reported to the HSE between September 1992 and March 2006. The leak frequency functions therefore represent average frequencies since the data has started to be collected up until March 2006 and does not reflect any trending in the rates experienced.

Users may wish to use leak frequency functions for offshore installations other than in UK waters or for onshore risk assessments. They should, however, note that these functions may not be representative of the environmental and maintenance conditions appropriate to the installation in question and the user may wish to reflect this difference by applying an appropriate systems modification factor.

The default location for the new *.STL file ('HCRD_06.stl') can be found in the Project input window, under the *General* tab as illustrated in the next page. This illustration also shows where the name and file location information are stored for an example UTL (User Defined Type Library) file. The name and location for both files are stored under the *Base Element Type Libraries* section.



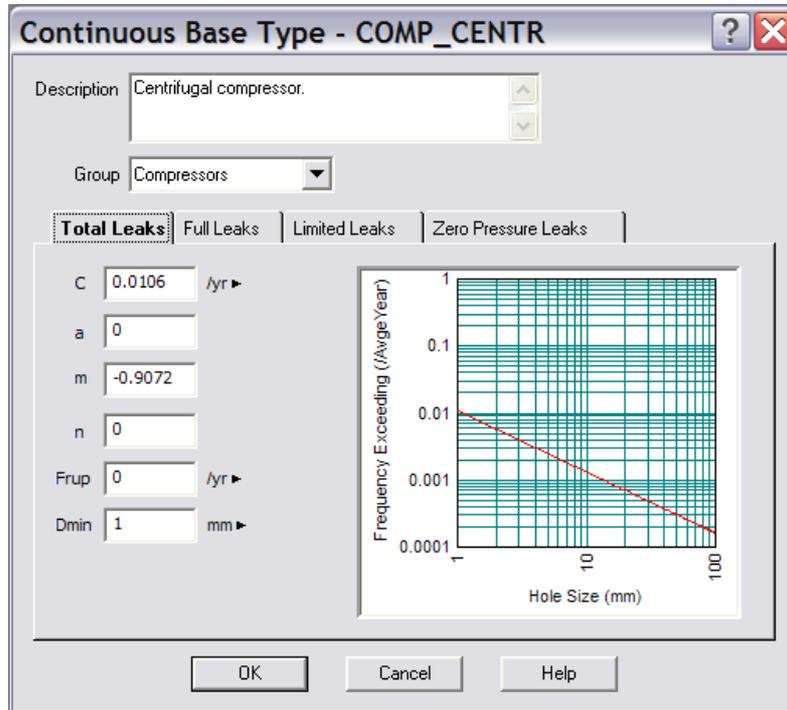
Example of Project input window showing the Calculation Basis and the paths to the Base Element Type Libraries *.STL and .UTL

Single or Multiple Categories

In the new Leak v3.2, users have a choice between using Single or Multiple categories. In the Multiple categories case the Leak frequency function is calculated separately for different scenarios which may have different consequences for the same hole size. The STL file provided with this issue of Leak considers four categories; *Total*, *Full*, *Limited* and *Zero Pressure* leaks. The following definitions are taken from Reference 1:

- *Zero Pressure* leaks, where the actual pressure inside the equipment is < 0.01 barg. This may be because the equipment has a normal operating pressure of zero (e.g. open drains), or because the equipment has been depressurised for maintenance.
- *Limited* leaks, where the equipment is under pressure but the outflow is much less than from a leak at the operating pressure controlled only by Emergency Shutdown (ESD) and blowdown. This may be because the leak is isolated locally by human intervention (e.g. closing an inadvertently opened valve), or by a restriction in the flow from the system inventory (e.g. leaks of fluid accumulated between pump shaft seals).
- *Full* leaks, where the outflow is consistent with or greater than a leak at the operating pressure controlled by ESD and blowdown. This includes:
 - ESD isolated leaks, presumed to be controlled by ESD and blowdown of the leaking system.
 - Late isolated leaks, presumed to be cases where there is no effective ESD of the leaking system, resulting in a greater outflow.
- *Total* leak frequency functions use all the available reported releases greater than 1 mm in diameter. It should be noted that because of the way in which the leak frequency functions are derived, the leak frequency for a given hole size range calculated using the *Total* leak frequency functions is not necessarily equal to the sum of the frequencies from the other four categories.

Each Base Element type data has been restructured to include four contributing categories and these are accessed on different tabs (*Multiple* categories case) as illustrated below:



Example of new base type definition dialogue box

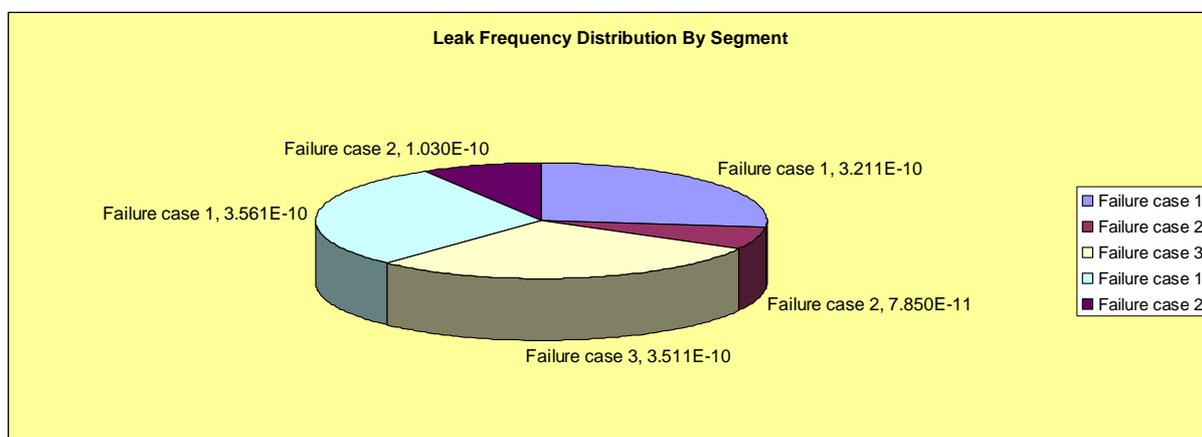
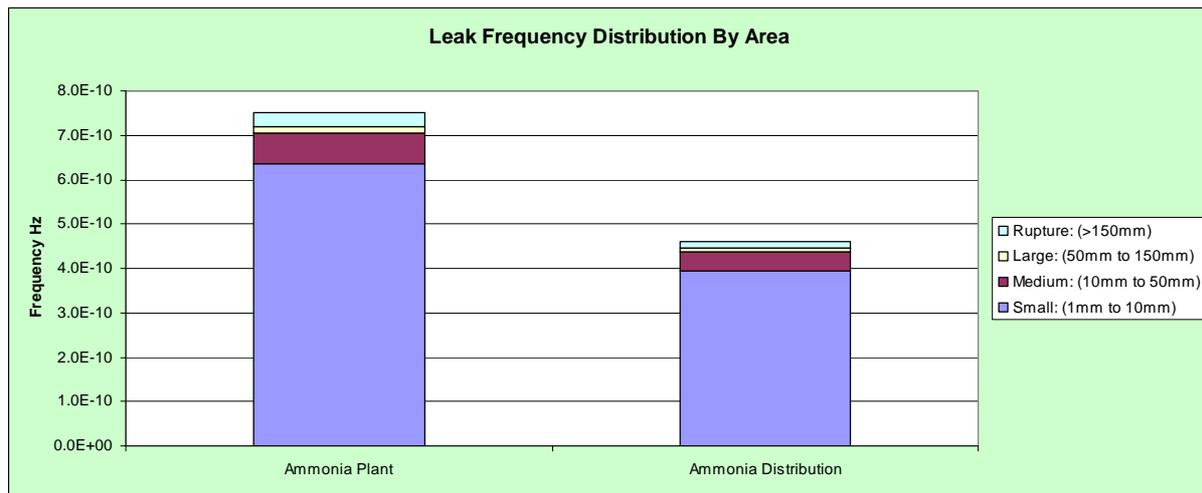
In addition a preview graph showing the exceedance frequency as a function of hole size is now displayed for each category, allowing the analyst to assess quickly variations in frequency.

If a *Single* category has been selected as the Leak Type calculation basis then the Continuous Base Type dialog above reverts to the *Total* leak category only.

Improved Reporting

The reports in Leak v3.2 have been simplified to present the relevant level of detail and restructured to handle both single and multiple categories. New charts have been added to the *Summary* report in the Excel report, which show the contributions from each Segment, Area and Equipment to the total installation. Examples of these new charts are shown on the next page.

The updated *.STL Base Element Type data used are reported in the *Continuous* and *Discrete* reports of the Excel report.



Examples of new charts available in the Excel Summary report

Upgrade Path for a Project Created in a Previous Version

Old Leak project files created in a previous Leak version (e.g. v3.1) will be upgraded automatically in Leak version 3.2 when they are first opened. The Base Elements will be upgraded to use the new Base Element Types in the STL. The Base Element upgrade process is able to cope with Base Element Types that have been renamed e.g. 'PIPE_PROC_xx', where xx is the pipe diameter, will be replaced by a single pipe Base Element Type. The details of these changes and the associated upgrade process are described fully in the online Help. The upgrade process is different depending on whether the Base Elements are continuous or discrete types:

For the Continuous Base Element Type, since the equation for hole size as a function of frequency used for the calculations has been updated with version 3.2, the input values set for Continuous Types in previous versions cannot be used. On opening an old Project File, the program will change the selection of the Standard Type Library file to the default *.STL file and rename the Equivalent Base Elements. Most of the Continuous Base Element Types in the new file have the same name as the equivalent Type in the previous files, but there are some types that have different names. A full list of the equivalent Base Element Type for the various STL file is available in the online Help.

If the Project file contains Base Elements that use a Type that is not present in the new default *.STL file, the program will leave these Base Elements in the Project but, in the calculations for a node that includes one of these Base Elements, the frequencies for the Base Element will be set as zero; messages will be written to the Log Window telling you that the Type cannot be found. A workaround exists to address this situation and is described in the online Help.

Whenever a User Type Library File created in a previous version is selected in the Project Properties dialog, the program will remove all Continuous Types from the Library, since the data for these Types

will not be valid with the new form of the Continuous equation. Messages will appear in the Log Window, listing each Type that has been removed.

The Discrete Base Element Type input values set in previous versions are still valid in version 3.2 since the fundamental form of the input data and calculations for this Base Element Type have not changed. However, in previous versions there was a single set of input data for each Discrete Type. So during the upgrade process, the existing input values are assigned to Total Leak; the values for the other three Leak Types are left unset. This upgrade will also be performed whenever a User Type Library File (*.UTL) created in a previous version is selected

New Leak Administrator Mode

Previously users other than DNV users could not view or modify the individual Base Element coefficients for the default Continuous and Discrete types. This operation is now available via a new Administrator mode for all users.

In the new version 3.2 of Leak, all users with user administrator rights - access is granted via the use of a password - now have the option to run Leak in administrator mode. Administrators are able to view and edit the contents of the STL Base Element Types. When changes are made to the Standard Type Library and User Type Library backup copies of these files will automatically be generated. This feature was added to prevent users from losing their original data, by overwriting it accidentally.

This functionality is aligned with all our other Safeti products.

Improvement in Help Function

All enhancements and new features are fully documented in the Help pages. These Help pages can now be viewed by pressing the F1 key on your keyboard. The same command - when entering data in an input window - will provide the user with a context sensitive Help or 'What's this?' help, which gives a short description of the selected field. The 'What's this?' help function is also available via a 'question mark' icon located at the top right hand corner in each input window. The user can simply click on the icon to activate the 'What's this?' function, direct it to a field in the input window and click again to get the short description of the field. This functionality is consistent with the help functions available in other Safeti products such as Phast and Phast Risk.

Step by step guidelines on how to setup a Leak analysis are still available in the help content as well as a help section on how to upgrade a project created in a previous version.

Licensing Methods

The design of licensing for the program has been simplified, and the licensing system is much easier to set up and maintain.

Single Licensing Method: FlexLM

The FlexLM licensing system is the only system used in v3.2. This licensing system is specific to a single machine or can be run concurrently on any machine across a network.

Integrated Installation of Licensing Software

The installation of the licensing software is now fully integrated with the installation of Leak v3.2. When you perform the installation of v3.2, all licensing files are also installed, and there is no need to run separate installations.

Central Location for all License Management Operations

There is a new License Manager which allows you to perform all license management operations, from generating requests for license files, to importing these files and enabling the licensing, to performing diagnostic checks on the license server.

You run the License Manager from the **Start Menu**, by selecting Programs > DNV > RMS License Manager > RMS License Manger. Click on the Help button in the License Manager dialog for details of the licensing functions.

New Features: Other Enhancements and Bug Fixes in version 3.2

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New Features: Other Enhancements and Bug Fixes in v3.2

Other Enhancements

There are several minor enhancements in the modelling and in the user-interface.

Backup of *.STL and *.UTL files

When changes are made to the Standard Type Library and User Type Library backup copies of these files are automatically generated. This feature was added to prevent users from losing their original data, by overwriting it accidentally (e.g. when making changes using Leak Admin).

Crash reporting feature added

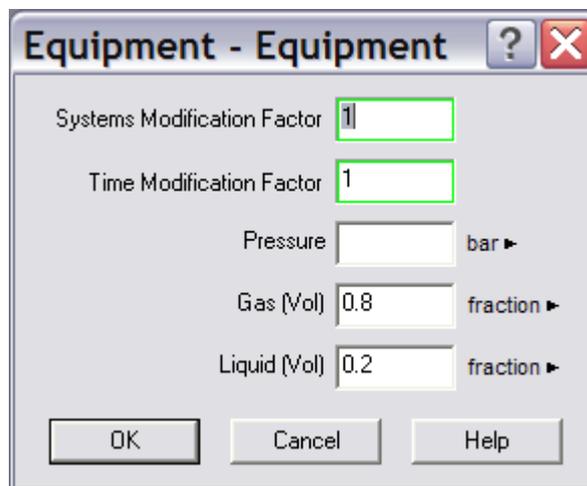
This feature is available in most Safeti products has been added. Crash Reporting improves the efficiency of finding and fixing bugs in the product. If Leak v3.2 does crash, a trace-back is generated that allows our developers to identify where the error has occurred.

Connected pipe field removed in Base Element input window

In Leak v3.1 a *Connected Pipe* field used to be available in any Base Element input window. This field has been removed in Leak v3.2 due to the fact that the *Fcat* component in the old Leak frequency function is no longer in use so this item of data is now redundant.

New Modification Factors

In previous version of Leak a modification factor - referred to as the *Frequency Modification Factor* - was available for users to modify leak frequencies calculated for all equipment items under a node, as a simple multiplication. In Leak v3.2, two modification factors are now available to users as illustrated below:

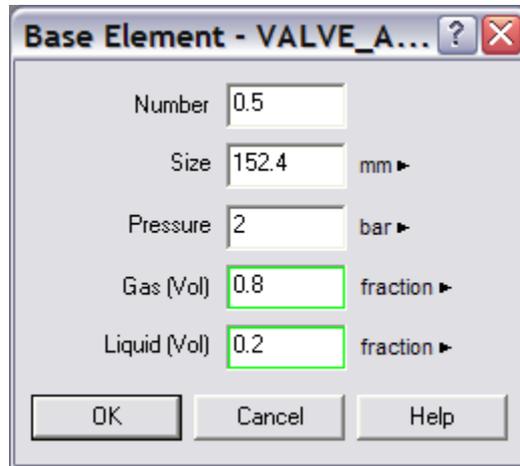


Example of Equipment definition dialogue box showing the two Modification Factors (with default values set to 1)

The first one is the *Systems Modification Factor*, which can be used to account for multiple systems. For example, if there are two Areas that contain identical equipment, this factor should be set to 2, and enter equipment count data for a single area. This other factor which has been introduced in Leak 3.2 is the *Time Modification Factor*. This factor allows users to account for the fraction of time for which the equipment is operational. These two factors allow users to correct leak frequency calculations for both time in operation and equipment count.

Number of Base Element Number modelled as a *real* number

In Leak v3.2 the number of Base Element is represented by a *real* number and not by an *integer*. This can be sometimes useful, for instance with valves. A valve is normally the boundary between two segments and a user may want to assign half a valve to each segment; an example is illustrated below with a number set to 0.5 (in one segment and the other half would be in the other segment).



Example of Base Element (valve) definition dialogue box with Number set to represent half of the valve (the other half could be included in a different segment)

Bug Fixes

There are several bug fixes in the modelling and the user-interface.

The Issue Number (SI) given for each bug is a unique reference number in Silk Issue Manager, which is the bug & enhancement logging tool used by DNV Software. If you require more information on a particular bug, please quote the SI number when you contact the Support Desk.

Unnecessary reporting for nodes outside the selected sub-node (SI 6394)

When reporting was selected on a sub-node, additional Leak information used to be reported for nodes outside the sub-tree. Although the calculated leak frequency and information were correct this additional information was not required thus it has been removed in Leak v3.2

Differentiation between Standard and User Defined Base Element Types in Report (SI 6397)

In the Excel report the Standard and User Defined Base Element types are now clearly distinguishable in the output reports.

Dragging and dropping nodes in specified positions (SI 6401)

It is now possible to explicitly control the sequence in which sub-nodes under a given node are ordered by drag & drop, or by holding down the CTRL key on your keyboard and pressing the up or down arrow keys. The functionality is also available from the *Edit* menu.

Representative hole size and release rate information reported (SI 6413)

If the Hole Size calculation basis is selected then Leak calculates a Representative Hole Size. The program then performs discharge calculations to obtain representative Release Rate associated with this hole size. If the Base Element contains both Gas and Liquid, the program will perform the discharge calculations twice: once for a Gas release, and then again for a Liquid release. If the Release Rate calculation basis is selected instead then a representative release rate is calculated (for both Gas and Liquid if need be). Both these representative values are reported in the Leak Frequency Report (text report) and in the Excel Report.

Input field update not possible following gas fraction error (SI 6415)

In Leak v3.1, if an erroneous gas fraction had been entered by mistake, an error message will be displayed but the user would not be able to correct the entered value without cancelling the operation and starting again or deleting the value in the liquid fraction field below first. This arises due to the link between the gas fraction and liquid fraction. This has now been changed in Leak v3.2 where the user will be warned if the gas fraction (or the liquid fraction) is outside the range - i.e. less than 0% or more than 100% - and needs to be changed.

Wrong interpolation method (SI 6419)

In previous versions of Leak the interpolation for discrete Base Element Types was wrongly performed in linear space rather than logarithmic space. This bug has been rectified in Leak v3.2.

Problems in Excel report for large studies (SI 6421)

In previous version of Leak, results for a large study could sometimes not be completely exported to Excel as the cut-off point for the maximum number of lines was set to 32,000 lines. The cut-off limit has now been increased in Leak v3.2 to prevent the loss of results in the Excel report.

Problems in loading a Leak 2.x study (SI 6422)

In Leak v3.1 a study created in version 2.x could not be read if the .LKU file name contained a '-' (dash). Such studies can easily be read now in Leak v3.2

Copy/Paste Base Element Bug (SI 6878)

In Leak v3.1 if a Base Element was copied using the *copy/paste* command then the frequency calculations would fail because Leak would rename the Base element. Leak would do so in an attempt to create a unique Base element type but this would unfortunately fail the calculations. The workaround in Leak v3.1 was to create a new Base Element using the normal *Insert - Base Element* command from the menu. In Leak v3.2 this has however been fixed and users can copy/paste Base Elements from one node to another.

Re-assign a Base Element Type to a Group (SI 7123)

When creating a new Continuous or Discrete Base Element type, in Leak v3.1, users can assign the Base Element to a Group (from a drop down list). If a group is selected then the new Base Element Type will automatically appear in the correct Group under the *insert* option at the equipment level. However in Leak 3.1, once a Base Element Type had been assigned to a Group it could not be unset; it could only be assigned to a different group. This issue has been fixed In Leak v3.2.

Incorrect frequency calculations (SI 7359)

For a Continuous Base Element Type, in Leak v3.1, frequencies were wrongly calculated when the size of the Base Element (*D*) was equal to the upper bound of any Hole Size Categories (e.g. 150mm in a category 'From 50mm To 150mm'). This has now been corrected in Leak v3.2

Error message for Frequency Exceedance if not entered in descending order (SI 7377)

When frequency data are entered for the definition of a Discrete Base Element Type, the data must be entered in ascending order of hole size. You will not obtain an error message if you break this rule, either from the dialog or from the leak frequency calculations, but the results are unlikely to be correct. The values of Frequency exceedance must however be in descending order. You will not obtain an error message from the dialog if you break this rule, but when you open the Leak Frequencies Report or Excel Report, the following message will appear in the Log Window of Leak v3.2:

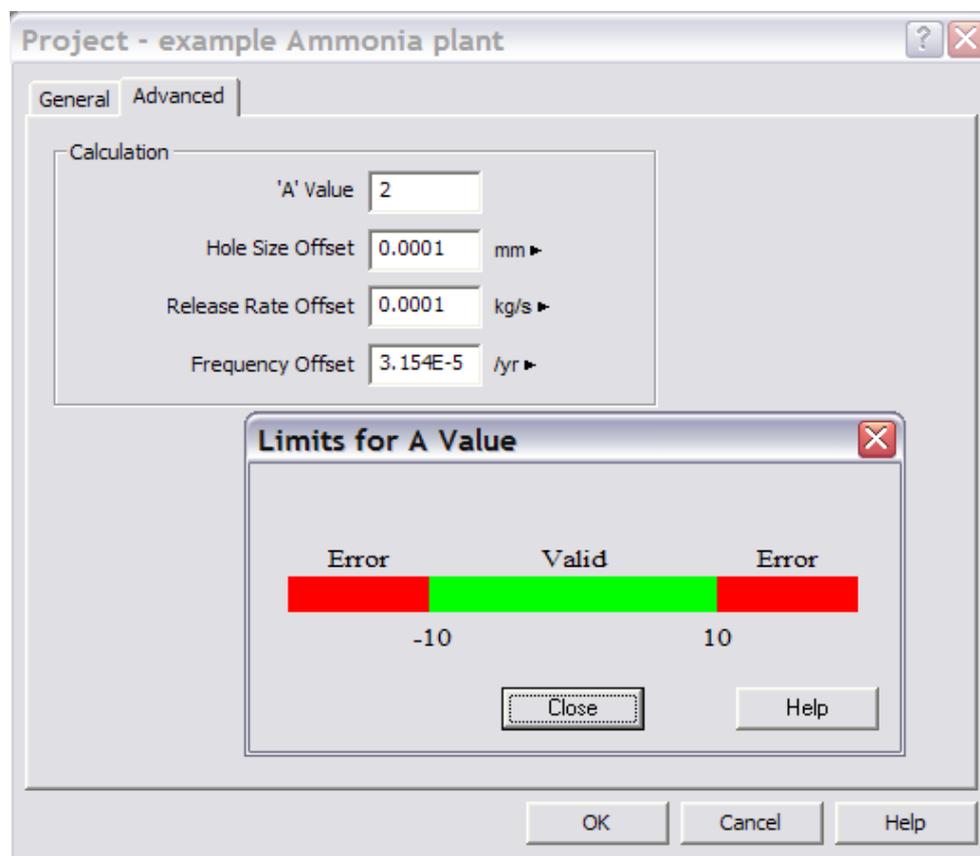
```
ERROR: Frequency discrete distribution is not decreasing in Example Discrete(Total Leaks)
```

Note that in this example the Discrete Base Element type name was "Example Discrete".

The program will however calculate the leak frequencies despite this error, but the frequencies for the smaller Output Categories will be zero.

Representative size calculations failure with extreme values of 'A' (SI 7383)

The 'A' value is a weighting factor used for calculating the Representative Hole Size in the Calculation of leak frequency, which is given in the Leak Frequencies Report and the Excel Report. The Help pages provide more information on how this 'A' value is used in both the Continuous Type and Discrete Type calculations. The default value is 2. For Discrete Types, this will give a Representative Size for the Category range that is slightly larger than the average size for the range, and for Continuous Type it will give a Representative Size that is smaller than the average size. To increase the Representative Size, increase the 'A' Value, and to decrease the Size, decrease the 'A' Value; 'A' Value can be negative. The mean diameter is not reported any longer in Leak v3.2 but could be reproduced by changing the 'A' value to 1. A lower limit and an upper limit of -10 and +10 respectively have been introduced for this 'A' value as illustrated below to prevent the Leak program from crashing.



Example of Advanced default parameters and new minimum and maximum values allowed for the 'A' value in the calculations

Alerts and Workarounds

There are no known bugs that have not been fixed in v3.3 at this stage or some aspects of the program that may give behaviour that you do not expect.

However for the most up-to-date list of known bugs and other issues, see the Global Technical Support area of the DNV Software website: <http://www.dnv.com/software/>. In order to access the support information, you must enter a valid user name and password, which you can obtain from your local DNV Software office.

Any bug found will be recorded under an SI number which is a unique reference number. If you require more information on a particular item, please quote the SI number when you contact the Support Desk.

Making the Most of the Leak Documentation

The Documentation folder on the Leak v3.2 CD contains a wide range of information on the program, and should enable you to find answers to most of the questions you may have about Leak.

The contents of the folder are described below, in the order in which they appear inside the folder.

Leak v3.2 Compiled Help

The Online Help for Leak v3.2 is in the form of a *.chm file—a compiled HTML Help file. The file will be installed with the rest of the Leak files when you install the program, and you will normally access it using the Help menu, but you can also open and read the file directly.

In order to read the files, you must have Microsoft Internet Explorer Version 5.0 or later installed on your PC, although it does not have to be your default browser. You must also have some additional files that are specific to Microsoft HTML Help; these are installed automatically during the Leak setup process, so you should be able to read the files directly if you have already installed Leak.

Leak v3.2 Release Notes

These Release Notes are supplied in *.PDF form, for future reference.

Leak v3.2 Installation Notes

The Installation Notes provide guidance during the installation on the installation choices and the new licensing system.

For System Administrators: Technical Notes

These notes give technical details to help you improve the performance of Leak v3.2 on your system. They are aimed mainly at secondary support personnel (e.g. IT professionals), but may be useful for expert users.

Note: Leak v3.2 will not install under **Microsoft Vista**. If you try to perform in the installation on Vista, a message will appear telling you that the installation cannot proceed. However please note that all products will be tested on vista before the end of 2007 and an official release date for vista support will be announced before the end of Q1 2008.

System Requirements

The recommended specification for Leak v3.2 is as follows:

Operating system	Windows XP, Windows 2000, Windows Server 2003. If you have a range of machines with different operating systems and want to choose a machine on which to install LEAK, you should choose a machine with Windows XP. Note: installation on Microsoft Vista is currently not supported.
Internet Browser	IE 5.0x. This does not have to be set as your default browser, but you must have it installed if you want to access the Help.
Display	800x600 resolution
Screen colour depth	65536 (16-bit) and higher
CPU	Pentium III or higher
Clock speed (MHz)	450 MHz
Memory (MB)	32 MB or higher (64 MB or higher with Windows NT)
Hard disk space (MB) (user)	60 MB
Media	CD or DVD-ROM drive
Pointing device	MS Mouse or compatible

References

1. “LEAK FREQUENCIES FROM THE HYDROCARBON RELEASE DATABASE”, John Spouge, DNV Consulting, Hazards XIX Process Safety & Environmental Protection Symposium, March 2006.