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Manufacturers of laboratory calibrated temperature and humidity data loggers, real-time monitoring and cold chain solutions

Refrigeration Index (RI) Statistics built into Temprecord TRW Software

Refrigeration Index (RI) Statistics

Temprecord can also calculate and display RI ([Refrigeration Index](#)) statistics. To enable this facility, click on [Options/Statistics](#), and make sure [Show Refrigeration Index Statistics](#) is checked. The RI statistics are displayed after the PHI statistics. The RI statistics are calculated between the start and end samples only. Remember that if a file has just been loaded the start sample is set to the first sample and the end sample to the last sample.

The RI value is calculated for each sample and is cumulative. If the temperature falls below 7.0 degrees C the RI value at this point is reported. The RI value is also reported at the end sample, regardless of whether the 7.0 degree C temperature was reached.

The time interval taken for the temperature to fall to 7.0 degrees C is also reported.

The RI value displayed is a logarithmic value, and represents the base 10 log of the number of generation increases over the time period.

If the [Show Refrigeration Index Statistics](#) option is checked the refrigeration index is also plotted on graph view. See [Refrigeration Index Graph View](#) for more information.



The RI statistics are presented as a guide only. They do not represent any actual measured growth of organisms present in the monitored environment. The statistics calculated are based on information and techniques developed by Meat and Livestock Australia.

For more information on the derivation and application of RI statistics, see the topic [Refrigeration Index](#).

The settings of the [lower and upper limits](#) affect how the statistical data is displayed. See the topic [how the limits are used when Temprecord displays data](#) for more information.



You can also change the view mode from the [pop-up menu](#) that displays when you press the right-hand mouse button.

Please note that this information is in the Help Menu of the TRW software. Enter “refrigeration index”.

RI Statistics data can be viewed in the Statistics part of the report.



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Refrigeration Index

Introduction

Temprecord can calculate and display Refrigeration Index values. The Refrigeration Index is calculated from the [start sample](#) to the [end sample](#), or over the whole sample record if these have not been set. See [Refrigeration Index Graph View](#) for details.

The following text is based on a document supplied by Meat Livestock Australia. It describes how to apply the RI values calculated by Temprecord.

Lag phase

A lag phase may occur when a bacterium moves from one environment to another, especially if it has to adjust to a new environment. The hot boning work described above demonstrated a good correlation when 5 generations of lag were introduced to the equation. 5 generations of growth ($1.5 \log_{10}$) can be subtracted from the calculated refrigeration index in situations where a lag may occur.

The question 'the starting temperature is hot' determines whether a lag is applied. If the meat is hot or warm, then it is assumed that *E. coli* has recently been introduced to the meat surface and a 5 generation lag is allowed. If the meat is cold, then it is assumed that *E. coli* may already be present on the meat, has adjusted to the environment and is ready to grow as soon as the temperature rises.

The lag phase can be programmed from the RI options.

Temperature

Temperature is the only parameter that can be entered by the user. Temprecord uses the temperature samples from the Start Sample and calculates the RI value cumulatively from then on until the end sample is reached. If the temperature record cools to below 7C the RI value at this point is recorded also.

The Predictive Model

The predictive model used in this calculator was developed by Dr Tom Ross and colleagues at the University of Tasmania. The model has been published (Ref. 1 below).

An evaluation of the model against data in the literature has also been published (Ref. 2 below).

The use of these models in hot boning applications and validation data has been described in an MLA publication that accompanies the Hot Boning Index Calculator CD ROM (Ref 3 below).



Remember that you must have the Statistics option '[Show Refrigeration Index Statistics](#)' checked in order for Temprecord to display RI statistics

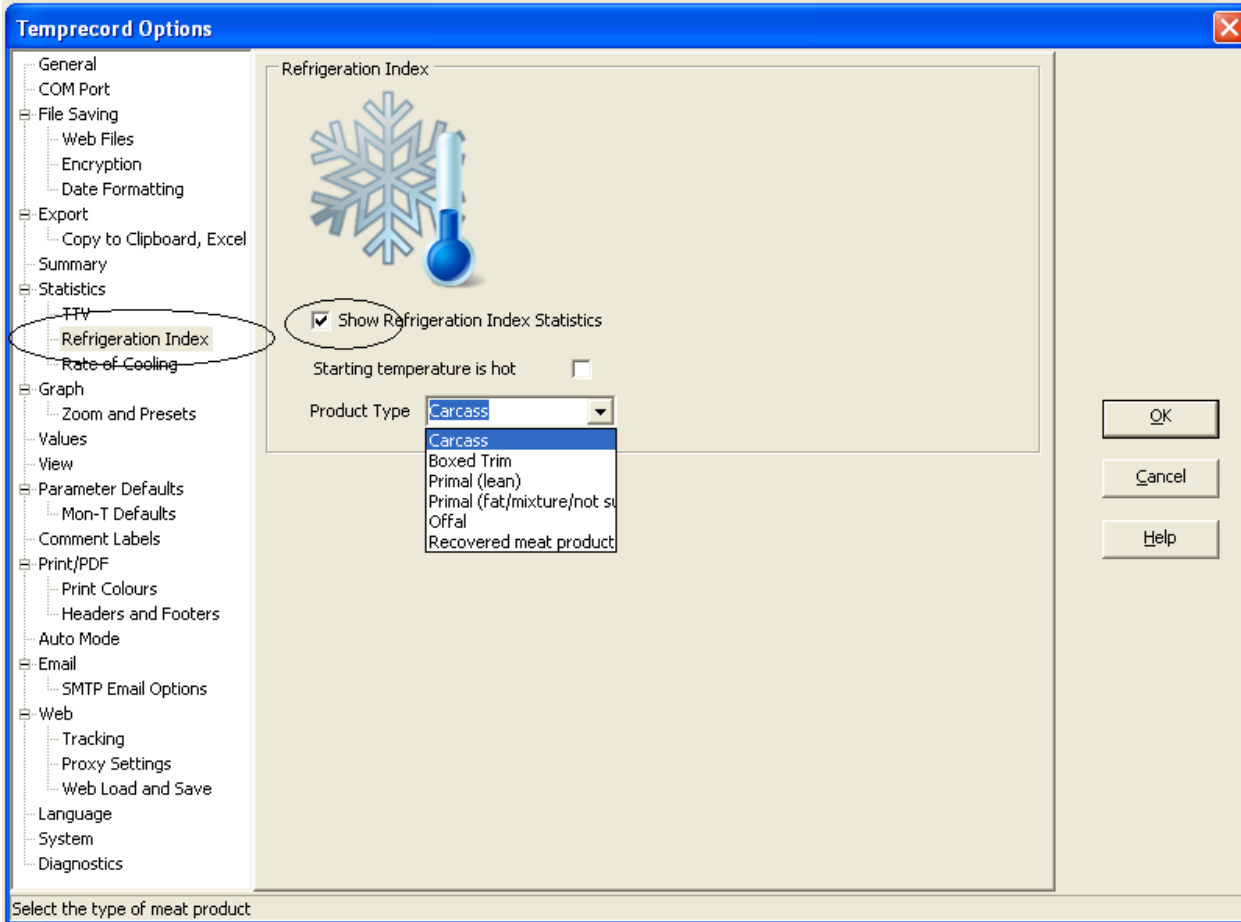
References/Further reading

1. Ross, T., Ratkowsky, D. A., Mellefont, L. A. and T.A. McMeekin, T. A. (2003) Modelling the effects of temperature, water activity, pH and lactic acid concentration on the growth rate of *Escherichia coli*. *Int.J.Food Microbiol.* 82: 33-44.
2. Mellefont, L.A., McMeekin, T.A. and Ross, T. (2003) Performance evaluation of a model describing the effects of temperature, water activity, pH and lactic acid concentration on the growth of *Escherichia coli*. *Int.J.Food Microbiol.* 82: 45-58.
3. Meat & Livestock Australia (2004) Validation of the chilling of hot boned manufacturing meat and primals. PRMS.020



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To select RI statistics, go to **Options/Statistics/Refrigeration Index** and select “Show Refrigeration Index Statistics”



Resulting RI Statistics data such as those below can be viewed in the Statistics part of the report.

Refrigeration Index (RI) Statistics

The following growth statistics pertain to the data between the start and end markers (samples 1 through 913). The results are from methods developed by Dr Tom Ross and colleagues at the University of Tasmania. They are a guide only and do not represent any actual measured growth. For more information, see the on-line help (press F1).

Start Marker is at sample	1	(Friday, 13 April 2012 10:32:48 a.m., 23.86 °C)
End Marker is at sample	913	(Monday, 16 April 2012 2:32:48 p.m., 22.26 °C)
Duration	76:00:00	
Product Type	Carcass	
Sample Period	0:05:00	
Starting Temperature	hot	(5 generations of lag applied)
Lower Threshold	7.00 °C	(reached at Monday, 16 April 2012 2:07:48 p.m.)
RI at lower threshold	3.014	
Time to cool to threshold	75:35:00	
RI at End Sample	3.038	