Rapid Screening Device - RSD™
Technical Application Note 1
Baseline and Heating Rate

Introduction

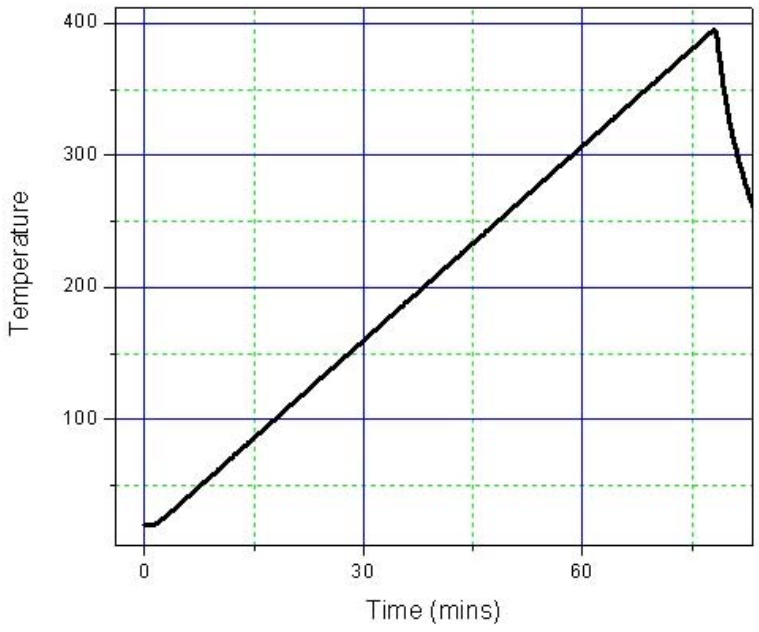
The ability of the RSD to scan linearly over its temperature range is important. In design studies that led to the proof of concept emphasis was placed not just on a linear ramp, but the ability to heat rapidly to a high temperature to allow rapid screening tests and the ability to ramp slowly to allow careful tests with high quality data. The ability to accurately hold an isothermal 'soak' temperature was a priority. In addition emphasis was placed upon rapid transition from start to ramp and from ramp to soak. The ability to change ramp rates rapidly was necessary. From these considerations the re-circulating air bath principle was developed and as the data contained here shows the heat method developed in the RSD has allowed the operation of the RSD to meet targets and thus give the quality of data expected from all users. In addition and not discussed in this short Applications Note other design aspects were equally important, for example pressure measurement and safety.

Experimental

Tests shown here have been carried out under a variety of heat rates and profiles. No sample was used in any test and in all, ARC-bombs were utilised. Other tests have been carried out with glass and tube bombs. The results and data from such tests are not reported here but data can be obtained from THT. In addition THT naturally have a large quantity of empty bomb heat up / isothermal / soak test data. Such data can always be requested from us.

Results

The main graph here shows a heat up of an empty bomb from ambient to 400ºC at 5ºC/min. Plots shown overleaf indicate faster and slower ramp rates.



Heat up over the range of the RSD at 5C/min

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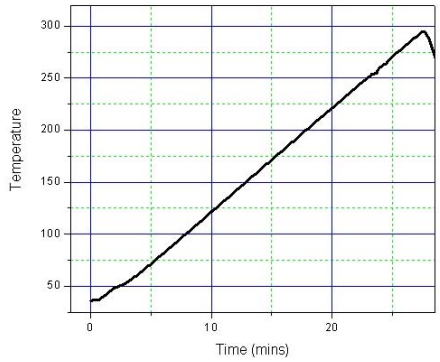
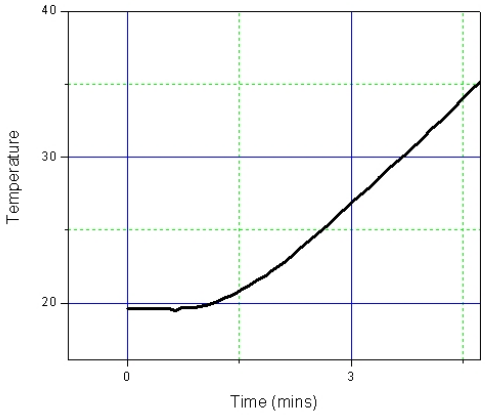
Discussion and Conclusions

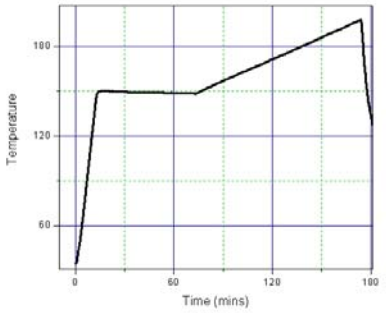
The graph shown overleaf can be seen to show the linear ramp at 5ºC/min to 400ºC, this is the specification of the RSD. But the RSD is also specified to ramp at 10ºC/min to 300ºC. This is shown in the plot below.



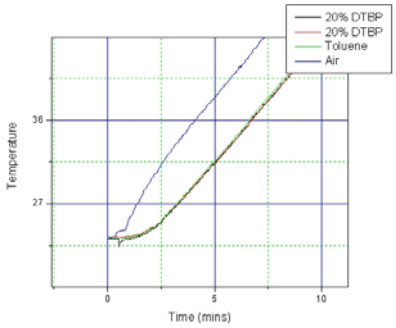
The speed of transition from start to ramp is rapid. The graph below shows that in a period of about 1 minute and over a temperature range of 2ºC the ramp (here of 5ºC/min) is achieved.



This is also evident in the next graph that shows ramp at 10ºC/min leading to a 60 minute soak and followed by a ramp at 1ºC/min. The ability to ramp—soak and ramp (at another ramp rate) is a standard feature of the test set-up software. This graph also shows the lack of overshoot and the rapid cooling.



Samples within containers will have some effect on ramping rates and transition from wait to ramp and on cooling rates. However the RSD design minimises this effect. With a relatively large sample the transition to ramp takes nearer 2 minutes and 4ºC.



Rapid cooling is an equally important consideration. The RSD has a quench cooling facility, this will activate at the end of a test and to stop a test if a cool parameter is reached (eg pressure limit). Cooling air is activated and this stays on until the Cool Temp is reached (here this is set at 80ºC).