

# CONSULTANCY REPORT

Sample report

**Desiccant Capacity @22°C  
(Specific vs Absolute Capacity)**

**INTERMEDIATE** ● ● ○

**B A L T I M O R E**

INNOVATIONS

Experts in Humidity and Moisture Control

# CONSULTANCY REPORT

Sample report

Dr Mark Valentine D.Phil. (Oxon) – INTERMEDIATE – 07 June 2016

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## 1

## Introduction & Client Requirements

The customer is using silica gel desiccant. The desiccant is supplied as a continuous strip. The strip is wrapped around a core creating a reel of desiccant. This reel can then be fed into automatic machines, to dispense the desiccant into the packaging at high speed.

The customer wishes to investigate how long they can expose the reels for, before the product *is no longer fit for purpose*. This is important in the event of production down time, they can then decide whether the reel can *still be used* or if it *must be discarded*.

To calculate acceptable exposure times, our SUPERDRYSIM software was employed. This can account for a range of environmental conditions and considers an acceptable level of capacity loss, to determine the critical exposure time. The report considers only the applicable production conditions at present at the site, which are taken to be 22°C/35% RH.

## Clarification of Terminology

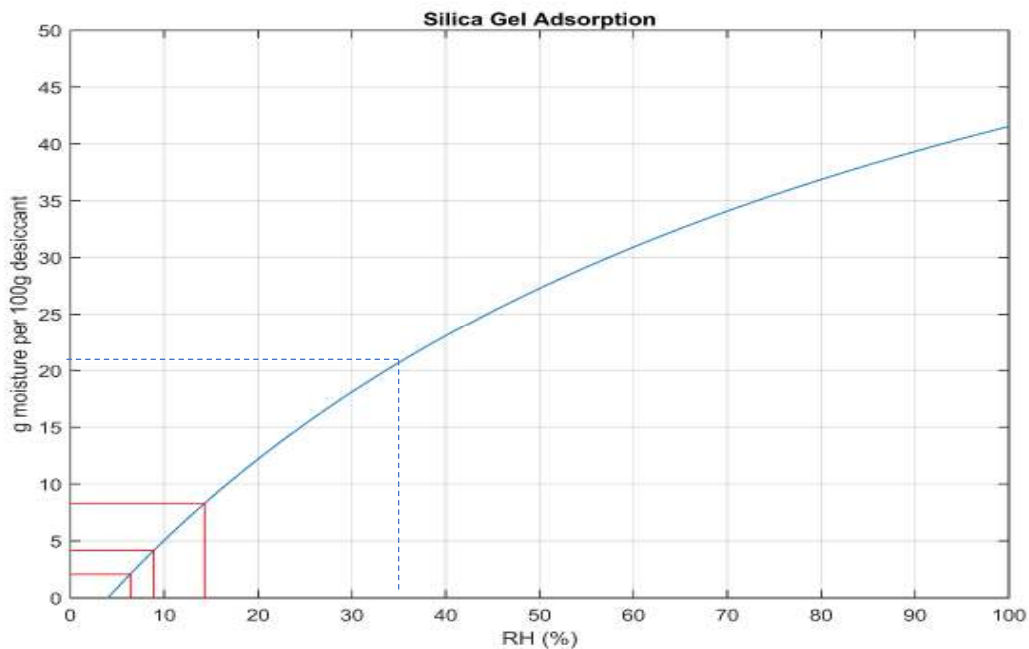
For the purpose of making a recommendation, we first need to define the following:

### ***Absolute Capacity***

The equilibrium capacity, by weight, of the desiccant to adsorb moisture at 100% relative humidity (RH). This is the maximum capacity, around 42% for silica gel beads.

### ***Specific Capacity***

The equilibrium capacity, by weight, of the desiccant at a specific RH. This capacity is plotted in Figure 1 (below). At 35% RH the specific capacity of silica gel is around 21%.



## Clarification of Terminology

### ***Absolute Capacity Loss***

The moisture loading of the desiccant compared to the Absolute Capacity.

For example: 1g silica gel adsorbing 0.042g moisture is loaded to 4.2%. This equates to an Absolute Capacity Loss =  $4.2\%/42\% = 10\%$ .

### ***Specific Capacity Loss***

The moisture loading of the desiccant compared to the Specific Capacity.

For example: 1g silica gel adsorbing 0.042g moisture is loaded to 4.2%. At 35% RH this equates to a Specific Capacity Loss =  $4.2\%/21\% = 20\%$ .

## Analysis of Adsorption

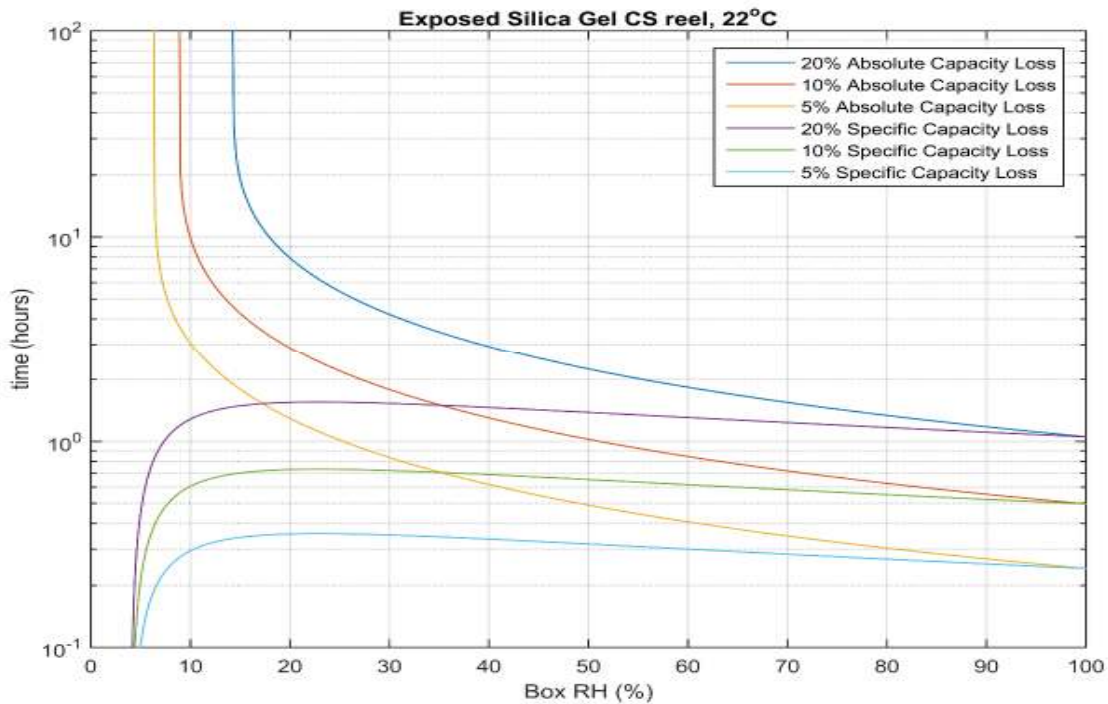


Figure 2 (above) shows the time taken for 5%, 10%, & 20% absolute and specific losses to occur with respect to relative humidity at 22°C. We note absolute and specific losses are the same, by definition, at 100% RH.

When considering a fixed RH operating environment it can be more useful to consider the specific losses as the equilibrium capacity is fixed.

However, when comparing a range of RH conditions for assessing capacity loss, specific losses become less useful. For example at low RH the capacity approaches zero. Therefore the capacity loss times also approach zero. So capacity is lost more quickly at low RH!

Clearly it is more meaningful to consider absolute losses. Here the failure time approaches infinity at low RH as we would expect.

## Results & Recommendations

To contextualise these results, let us offer the client three potential absorption capacity limits: a 5% loss and 10% loss and a 20% loss of capacity. Let us also offer the time for both *Absolute Loss* (which compares the decrease in performance relative to a theoretical maximum) and also *Specific Loss* (which gives the loss in total adsorption relative to the maximum attainable in the clients facility)

### 3 Potential Failure Thresholds & The Time at Which They Occur

	5% Loss	10% Loss	20% Loss
Relative to... <b>Absolute Capacity</b>	42 mins	1hr 24 mins	3hrs 18mins
Relative to... <b>Specific Capacity</b>	21 mins	42 mins	1hr 24 mins

Considering the remaining moisture-absorption capacity of the desiccant in each silica gel sachet and each sealed customer package, the customer must decide whether a 5%, 10% or 20% loss is acceptable, given their own known-requirements for absorption, within their package.

Once this threshold is set, operational staff can then very easily put-in-place procedures to replace the desiccant reel, in circumstances where the maximum exposure time is exceeded.

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### Further Contact Information

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