



# BatheSafe

*Peace of mind with the scald preventing, non-slip bath mat*

Creating an inclusively designed world in conjunction with RSA  
Design Directions 2007/08

**Ashley Kelly**  
**12/11/2007**

# Contents

---

## *Overview*

Identifying a Need .....	2
--------------------------	---

## *Research and Development*

Discover – Target User Questionnaire .....	3
Understand – Target User Feedback .....	4
Translate Requirements .....	6
Create Concepts - Design Embodiment .....	7

## *Technology – Thermo-chromic Inks*

About Thermo-chromic inks .....	8
Supplier Contact.....	8

# Thermo-mat

## *Bathe in safety with the scald-warning non-slip bath-mat*

---

### *Problem Overview*

Over **6,500** people go to hospital with a scald injury from excessively hot tap water every year. More than 600 of these are severe, and almost ALL of them are preventable.

Children and older people are more susceptible to scalds due to their sensitive and thinner skin, and three quarters of those with severe scalds are children, and around 15 elderly **DIE** each year as a result.

Scalding can occur at water temperatures above 45°C, and in many cases, household taps can deliver up to 70°C. This is the temperature that many domestic water heaters leave the factory.

*AT 70°C IT TAKES JUST 1 SECOND FOR ADULTS TO SUFFER THIRD DEGREE BURNS AND 0.27 SECONDS FOR CHILDREN OR ELDERLY.*

### *RoSPA Key Campaign*

Last year the Children's Fire and Burns Trust ran a similar campaign called 'Hot Water Burns Like Fire' (leaflet attached), and this year the key campaign for RoSPA is to raise awareness of the risks posed by hot bath water, and also the benefits of fitting TMVs, which cost around £80.

RoSPA are lobbying for regulations to be passed for TMV's to be fitted in all new and refurbished home throughout the UK, as it is in Scotland, Canada, New Zealand and, Australia.

Source: [www.RoSPA.com](http://www.RoSPA.com) Oct 2007

### *Identifying a Need*

Should RoSPA succeed with the regulations being implemented, there remains a need for the millions of existing homes to help prevent accidents.

### *Twofold Solution*

The Thermo-mat offers a pragmatic, simple solution suitable for everyone ranging from parents with babies to elderly or carers. Its uses are twofold – a simple bathmat, AND a safety device, utilising the technology of thermo-chromic inks with bold, simple graphics to warn against potential hazards.

# Thermo-Mat Research & Development

---

## *Discover – Target User Questionnaire*

Research has been carried out by a set of questions sent to 6 families with children, 6 elderly and 1 nursing home carer.

Q1. Does your household have Thermostatic Mixing Valves (TMV's - which control the temperature of the water at the outlet)?

Q2. What (if any) temperature indicating device do you use for bathtimes?

Q3. If you do use a device, how easy is it to use? ie if it's an LCD device, is the display large enough even (for those of you who need) without glasses? If it's a traditional thermometer is it fiddly and risk of dropping/smashing/child getting hold of it? Does it require batteries? Was it expensive?

Q4. Does it measure Celsius or Fahrenheit or both, and which do you understand?

Q5. If you do not use such a device, how do you check the temperature of your bathwater before getting in?

Q6. Have you or anyone you know been scalded or suffered any discomfort from overheated water?

Q7. If yes to above, what age were they and how bad was it?

Q8. Does/would it give you peace of mind to use a temperature controlling/indicating device?

Q9. How much would you be prepared to pay for such a device?

Q10. Thermostatic Mixing Valves cost around £80 to fit to each bath/sink, would you be prepared to pay for them, or would you happily use a cheaper alternative?

Q11. Do you think all new and refurbished homes should have TMV's fitted by law?

Q13. Any other points you can make or info you can give?

# Questionnaire Outcomes

---

## *Understand – Target User Feedback*

### *Households with TMV's*

Of all groups only three knew of their property having TMV's fitted on their shower mixers. (This is because it's regulations for properties fitted with combination boilers to have the device installed on their shower when the boiler is installed.)

### *Devices Used*

Of all the families with children, all but one used a device to check bath water temperature.

- Two of those were bath mats with a simple 'too hot' indicator, similar in principle to the Thermo-mat.
- Three of those used hand held thermometers.
- None of the thermometers required batteries.
- The one who didn't checked the temperature with the elbow or hand.
- All of them double-checked with their hand too.

Of elderly, not one of them used a device and checked the water temperature with their hands.

The carer used their hand/elbow.

### *Ease of use*

- Of the thermometer devices used, all agreed they were simple for them to use themselves, but elderly felt the smaller thermometers would be tricky to read and handle without glasses or if you had dexterity or mobility issues.
- Of the bath mats, all agreed they were designed for toddlers only, and therefore unsuitable for adults or the elderly.

### *Awareness*

- One younger adult knew a girl at school who was badly scarred from scalding in the shower, requiring skin grafts.
- Three of the elderly had known of accidents during their lifetime.

- One specifically mentioned his wife, who suffered from Multiple Sclerosis who, during her more mobile year would plunge into a bath far too hot and always come out ‘lobster’ red as she couldn’t feel the effects of the temperature.
- One knew a female in her twenties dying from a fall/slip in the bath.
- The carer has been made aware through their training of incidences where the local authority has been taken to court after scalding accidents, in some cases where the patient/cared for has died.

### *Peace of mind*

- Of the families with children, 5 out of 6 said they would use a device for peace of mind.
- Two of the elderly said it would, as long as it was easy to use.
- The carer agreed it would give peace of mind.

### *Retail price*

The majority of target users said they’d pay up to £30 for a device.

### *TMV fitting*

All user groups said they’d have TMV’s fitted only during refurbishments or new builds, and they all agreed that regulations should be passed to make it mandatory.

### *Other points*

It was brought to attention that work premises must have a ‘Caution’ sign displayed on any outlets where the temperature is not regulated.

The carer felt that as they were occupied with the moving and physical help of the cared for, that a device which requires no interaction and was read with just a glance would be a good idea.

## *Translate Requirements*

The high use of such devices, the awareness of scalding accidents and the peace of mind they give proved the market exists for such a product.

Ease of use was important to all groups - the requirement is to be able see at a glance if the temperature is too hot. Also no small parts, no batteries, and no installation were attractive.

Mentions of slipping accidents appeared even though they were not part of the questionnaire, so this encourages use of a two-fold product such as the bath mat.

If a temperature unit is given, elderly require the scale to be in Fahrenheit, younger users in Celsius.

The elderly seemed sensitive to the issue of being more vulnerable, so perhaps a more subtle solution would work best.

# Design Embodiment

---

## *Create Concepts*

Almost all of the participants own a bathmat. Parents with children chose their bathmats specifically because it includes a temperature indicator, so applying the same principle to other user groups I set about designing one which would appeal to adults and elderly as well as children.

The graphics need to be bold, colourful (so as to still appeal to children) yet not juvenile. Road sign style graphics are proven for their clarity and familiarity, so it seemed a good place to start.

The design process was mostly centred on the graphics, as the way the inks work is by going clear at a certain temperature, which can be controlled by the level of doping of the pigment. One technique is to use the thermo-chromic ink to 'reveal' an underlying graphic once it goes clear. With this method it's recommended to use black. This is the way most of the thermo-chromic thermometers already on the market are designed. Another method is to use the thermo-chromic inks themselves as the graphic, which is the method I adopted. For this it's recommended to use a white background.

Thermo-chromic inks are not suitable for precision readings. There is a 3 degree threshold between total opacity and total clarity, so as the temperature of the water increases through and above the desired temperatures, the graphics would in turn reveal with some overlap, but if they are bold enough, this is enough for the user to determine that the temperature is within the acceptable range.

*Develop Solutions...see design boards!*

# Technology - Thermochromic Inks

---

## Summary

Thermochromic inks or dyes are temperature sensitive compounds, developed in the 1970s, that temporarily change colour with exposure to heat. They come in two forms, liquid crystals and leuco dyes. Liquid crystals are used in mood rings. Leuco dyes are easier to work with and allow for a greater range of applications. These applications include: flat thermometers, battery testers, clothing, and the indicator on bottles of maple syrup that change color when the syrup is warm. The most well-known line of clothing utilizing thermochromics was Hypercolour. The thermometers are often used on the exterior of aquariums, or to obtain a body temperature via the forehead.

<http://en.wikipedia.org/wiki/Thermochromism>

## Supplier Contacts:

### CHROMAZONE® DISPERSION

ChromaZone® Thermochromic Dispersions are formulated for use in aqueous ink and coating systems that change from colour to colourless as temperature rises, with the colour reappearing when the temperature is reduced again.

The Thermochromic effect is a highly effective route to product promotion and differentiation. As well as being used as a marketing tool, ChromaZone can be used for a wide variety of functional applications including safety and security. The uses for ChromaZone are limited only by the imagination.

#### PRODUCT RANGE:

##### STANDARD COLOURS:

Blue\*, Black\*, Red\*, Magenta, Green & Orange

\* denotes available ex stock

##### SPECIAL COLOURS

Turquoise, Brown, Purple & Yellow

##### STANDARD RESPONSE TEMPERATURE:

15°C, 29°C, 31°C & 47°C

Other colours and temperature responses from -10°C to +69°C are available on request

##### PACKAGING:

1Kg, 5Kg & 25Kg Plastic Containers

<http://www.chromazone.co.uk/>

# Existing Products

There are many temperature indicating devices on the market already and not all specifically for children, the most interesting in my opinion being the Magi-Plug, (fig 1) which is an overflow protector with the added feature of a temperature indicating device.



Handheld thermo-chromic indicators, which tend to be small and juvenile in design



Digital floating thermometer - requires batteries



The Magi-Plug - an overflow protector as well as a temperature indicator



Digital bath spout cover with built-in thermometer - requires batteries and fitting



Bath mat with thermo-chromic warning - very popular with parents but not inclusive!



Traditional liquid-filled hand-held thermometer



Digital 'pen type' thermometer - very small display