



# RoHS

## Threats to the Industry

Presented at AEF 2005 by Roland Sommer  
Electronics South New Zealand

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# Introduction

## Electronics South

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Electronics South is the New Zealand Electronics Industry Association Body

Partly funded by the New Zealand Government

Four key strategic areas

1. Competitiveness and business capability
2. Connectedness – locally and internationally
3. Matching skills demand with skills supply
4. Funding and investment

# Introduction

## New Zealand Trade and Enterprise

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Government department for supporting New Zealand Industry

### Five Strategic Areas

1. Business Development
2. Export Services
3. Sector Development
4. Regional Development
5. NZ Success

# Introduction

## RoHS and WEEE Specialists (NZ) Ltd

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Private company specializing in RoHS and WEEE support for New Zealand

Formerly known as RM Sommer Consulting Ltd

Engaged by NZTE and Electronics South to support NZ industry for RoHS and WEEE compliance

# RoHS and WEEE Background

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Two European Directives come into force in 2005/6 which effect the supply of electronics into the EU

RoHS - Restriction of the use of certain Hazardous Substances in electrical and electronic equipment (2002/95/EC)

WEEE - Waste Electrical and Electronic Equipment (2002/96/EC)

# WEEE

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Specifies a definitive percentage of products by weight that must be reused, recycled or recovered

Producers (or importers) are responsible for end of life costs for recycling and disposal - including packaging

Comes into force 13 August 2005

# RoHS

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## Prohibits the use of 6 substances

- Lead
- Mercury
- Cadmium
- Hexavalent Chromium
- Polybrominated biphenols
- Polybrominated diphenol ethers

Enforcement date 1 July 2006 for any product  
“put on the market” from that date within the EU



# RoHS Threats

# RoHS Threats

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Lead-free solder

Material availability

Material logistics

Compliance declaration infrastructure

Viewing RoHS as only a manufacturing engineering issue

SME considerations

Time

# Threats

## Lead free solder

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There are a number of known technical issues with Pb-free soldering and a number of additional unknowns

The known ones are:

- Tin Whiskers
- Fillet lifting
- Lower process capability

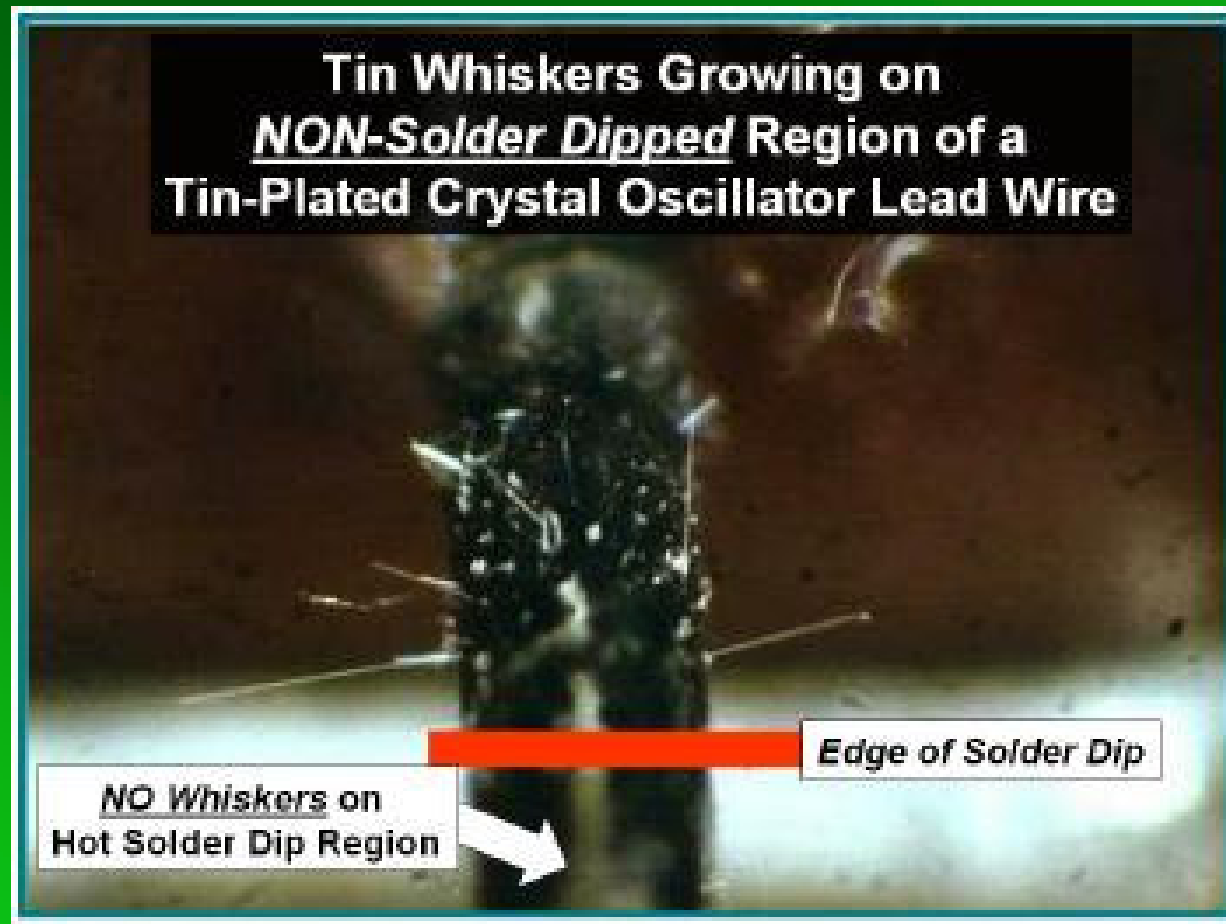
The unknown ones are

- Intermetallic migrations
- Any other potential issues with a new technology

# Tin Whiskers

<http://nepp.nasa.gov/whisker/>

April 2005 picture of the month - Nasa

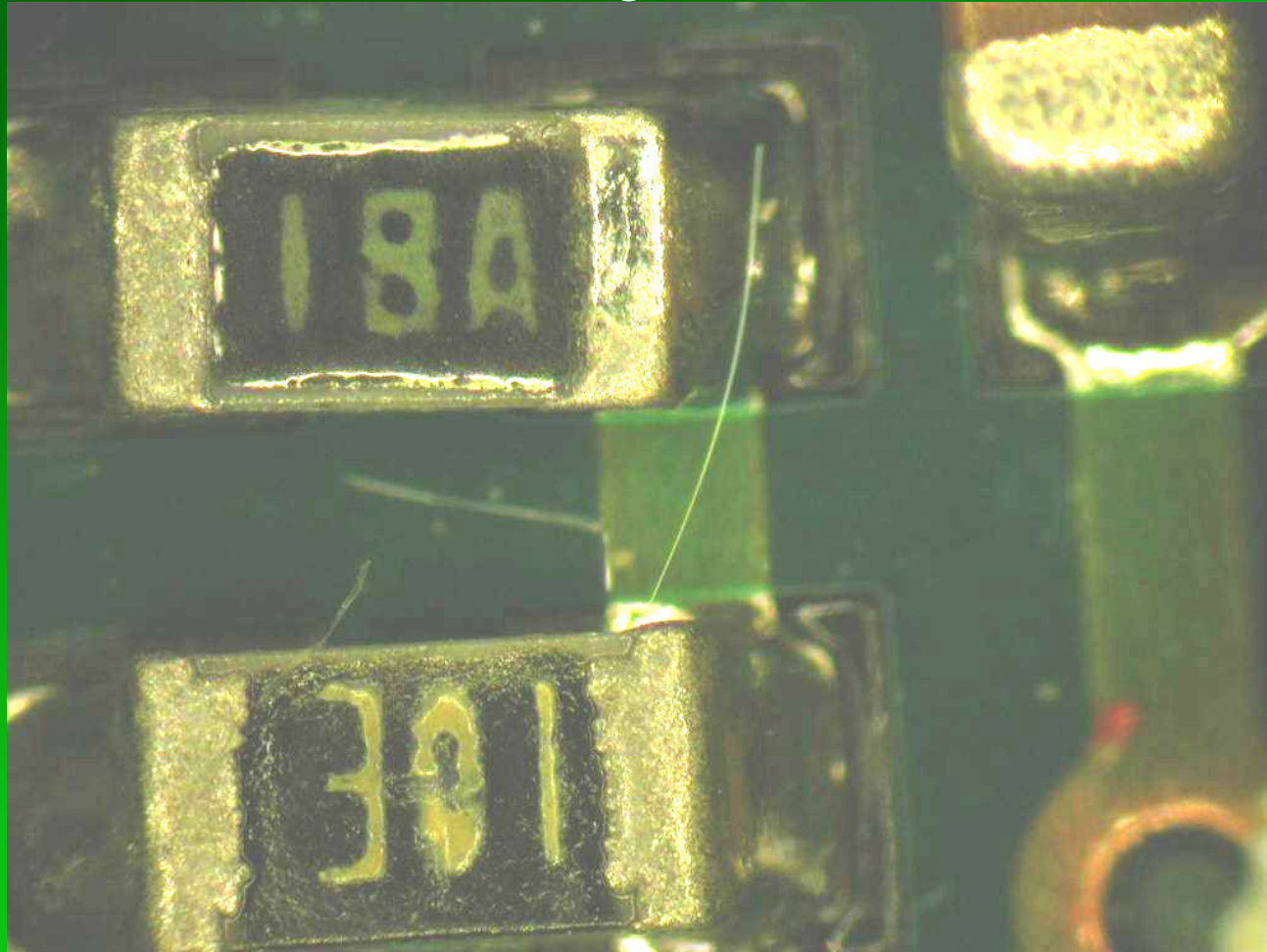


# Tin Whiskers

<http://nepp.nasa.gov/whisker/>



Tin whisker debris dislodged from RF enclosure



# On-Orbit COMMERCIAL (non-NASA) Satellite Failures



The following commercial (non-NASA) satellites have reportedly suffered on-orbit failures of their satellite control processors due to tin whisker induced short circuits where the whiskers grew on pure tin plated electromagnetic relays

Name	Launch Date	First Satellite Control Processor Failure	Redundant Satellite Control Processor Failure
<b>Complete Losses</b>			
GALAXY VII [PanAmSat]	27 October 1992	13 June 1998	22 November 2000
GALAXY IV [PanAmSat]	24 June 1993	(not caused by 'tin whiskers')	19 May 1998
SOLIDARIDAD 1 [SatMex]	19 November 1993	28 April 1999	27 August 2000
<b>Partial Losses</b>			
DBS-1 [DirecTV]	17 December 1993	4 July 1998	Still Operational
PAS-4 [PanAmSat]	3 August 1995	3rd quarter 1998	Still Operational
GALAXY IIIIR [PanAmSat]	15 December 1995	21 April 2001	Still Operational
DirecTV 3 (DirecTV)	9 June 1995	4 May 2002	Still Operational

# Process Capability

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The process capability of Pb-free solder is much less than that of eutectic Sn/Pb solder

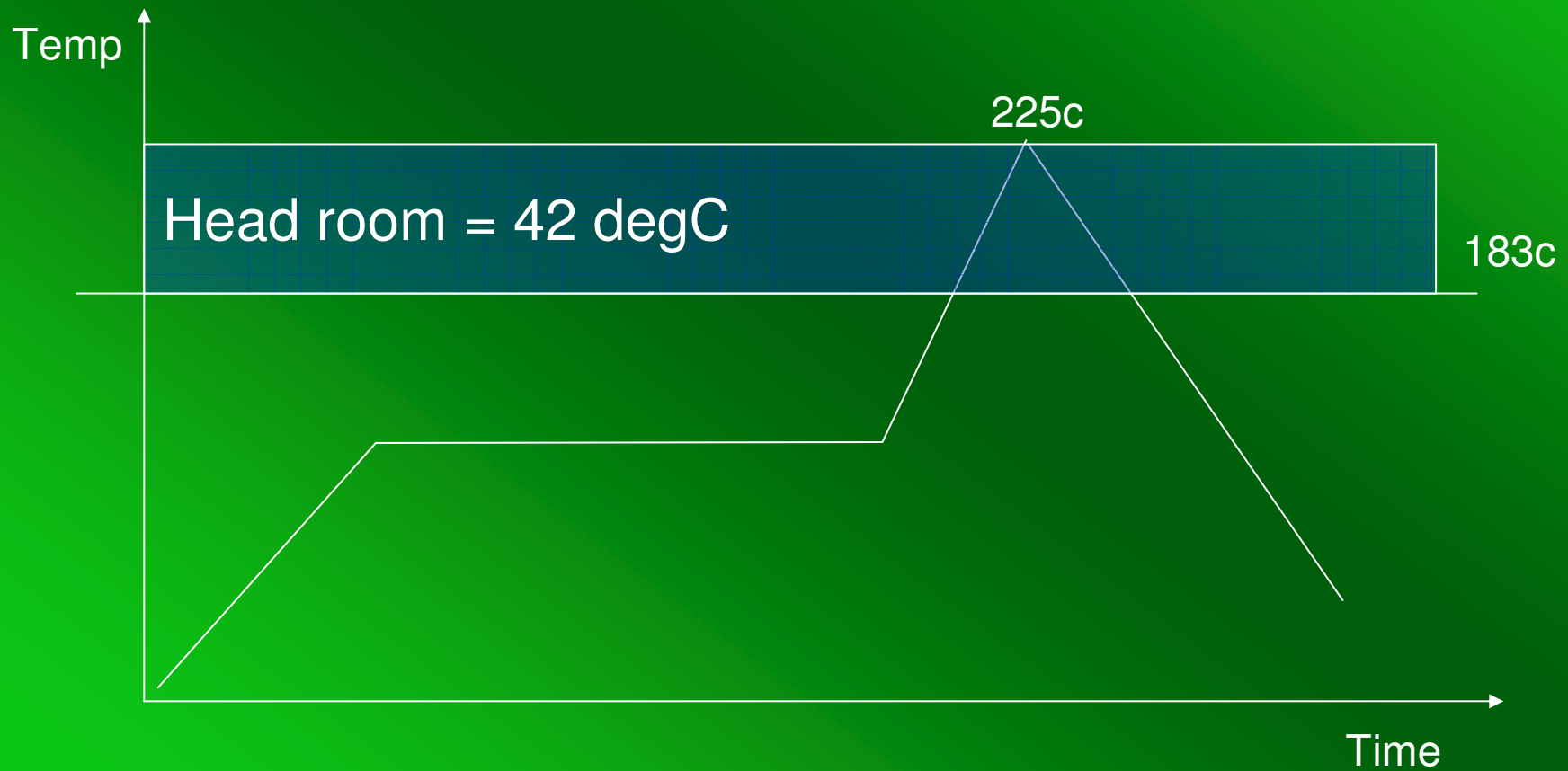
Sn/Pb solder melts at 183 deg C

Sn/Cu/AG solder melts at 217 Deg C

## IPC/JEDEC J-STD-020C

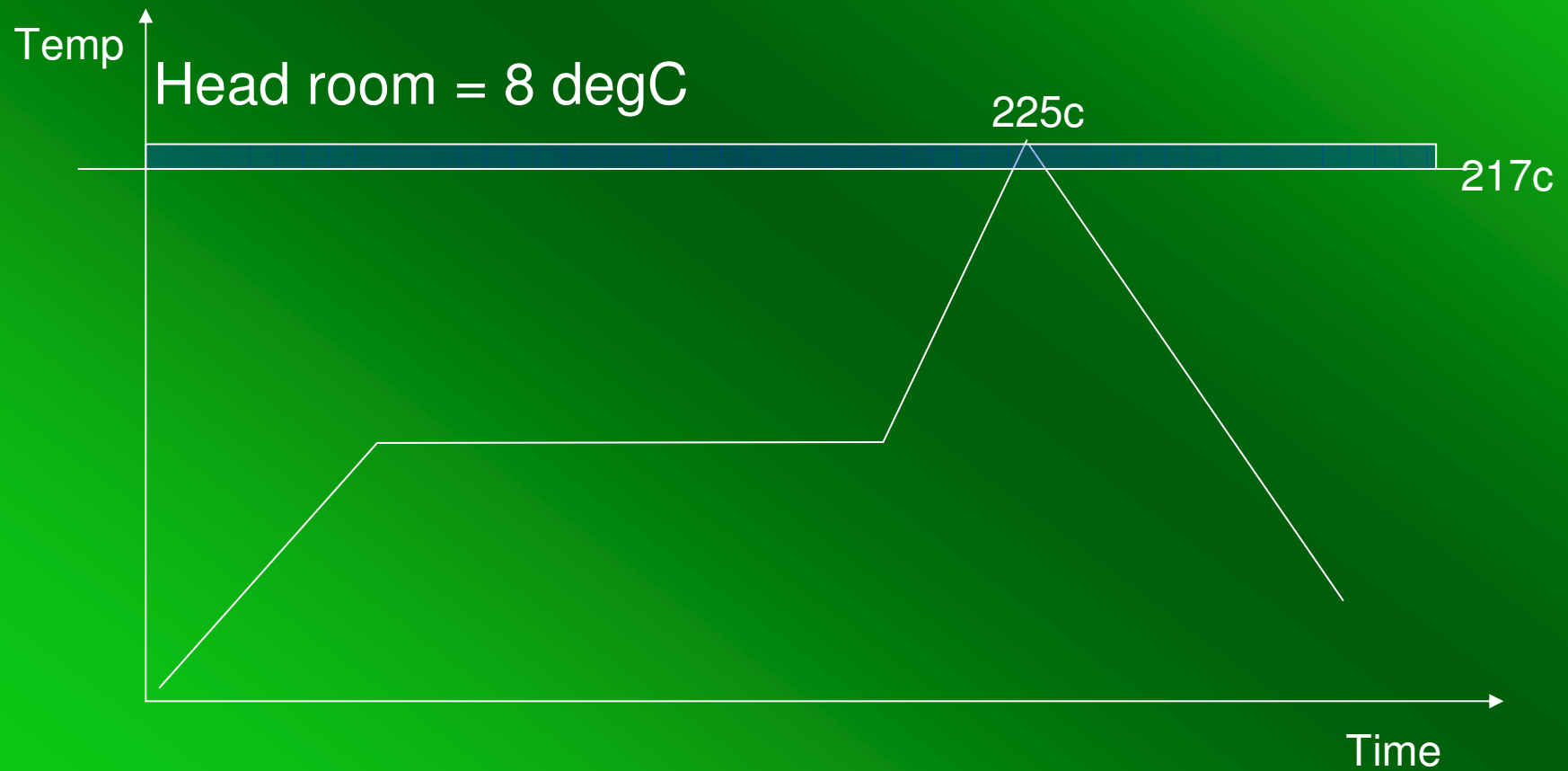
- Large SMT package Sn/Pb: 225 degC peak processing temp
- Large SMT package Pb-free: 245 degC peak processing temp

# Lower Process Capability IPC/JEDEC J-STD-020C Sn/Pb



# Lower Process Capability

## Non IPC/JEDEC J-STD-020C Pb-free process



# Lower Process capability

## IPC/JEDEC J-STD-020C compliant Pb-free process



# Process Capability

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Many device manufacturers have only changed the termination finish on their components to Pb-free and have not addressed the effects of the elevated temperatures on the device packaging

Many devices do not presently meet the new requirements of IPC/JEDEC J-STD-020C

## Solderability and compatibility

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Pb-free solder has a greater surface tension

This results in much poorer wetting characteristics

Pb-free pastes tend to be less well developed than Sn/Pb pastes as there has been less usage and trial history – Most pastes have been around for less than 2 years

# BGA issues

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## BGA devices are not fully compatible between processes

- A Pb free BGA in Sn/Pb process will not reach liquidus on it's balls turning it into a pseudo LGA but with a much lower pad contact area and virtually impossible to X ray inspect as the solder fillet is obscured by the unmelted ball
- A Sn/Pb BGA in Pb free process risks having it's ball flux exhausted due to the higher process temperature and it is unlikely to be rated to IPC/JEDEC J STD 020C for packaging temperature for Pb free process

# Threats

## Material Availability

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### SMT passives

- Freely available

### SMT actives

- Becoming available

### PTH Components

- Lead free becoming available but not wave solder capable especially connectors
- Alternative to wave solder is Pin in Hole or Hand Solder. Both will increase cost and processing time
- Is wave solder going to become a redundant process for lead free?

# Threats

## Material Logistics

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### External supply chain

- Grey market where is the declaration of compliance?
- How far do you have to go to demonstrate due diligence?
- Sample screening with XRF?
- What about variability of Chromium?

### Internal Supply chain

- Separation of processes – Pb free and non Pb free
- Solder bath contamination – cannot rework
- How far do you have to go to demonstrate due diligence in internal traceability?

# Threats



## Compliance declaration infrastructure

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The RoHS directive makes no mention of compliance method. This is up to each individual country.

The UK have legislated that a technical file on each component needs to be kept

This needs to include the material to underpin the declaration of compliance to RoHS

Legally untested

# Threats



## Compliance declaration infrastructure

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The UK state that you need to “exercise all due diligence” and have “reasonable grounds” to believe the declaration

The two ends of the spectrum

1. An email from a buying house stating that the part is RoHS compliant
2. A signed material composition declaration conforming to IPC 1752

We will only know after the first case goes to the European Court

# Threats



## Viewing RoHS as a manufacturing engineering issue

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Lead Free soldering is intensive in manufacturing process engineering

Other aspects frequently forgotten that have nothing to do with manufacturing:

- Lead in cables
- Yellow colorant – lead oxide, cadmium, lead chromate
- Cr6 passivation (chromating) on nuts bolts screws, aluminium, pre treatment for powder coat
- Flame retardants in plastics
- Re-qualification for CE, UL, etc

# Threats SMEs

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Small to Medium Enterprises need special consideration

Component volume is lower

- Nuts, bolts and screws where electronics is only a minor part of supplier's total business
- Cables where the export market to the EU is only a minor part of the supplier's total business
- Capital equipment cost
- Available resource – clear conflict with “Lean” principles
- Limited external support services available

# Threats Time

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12 months to go

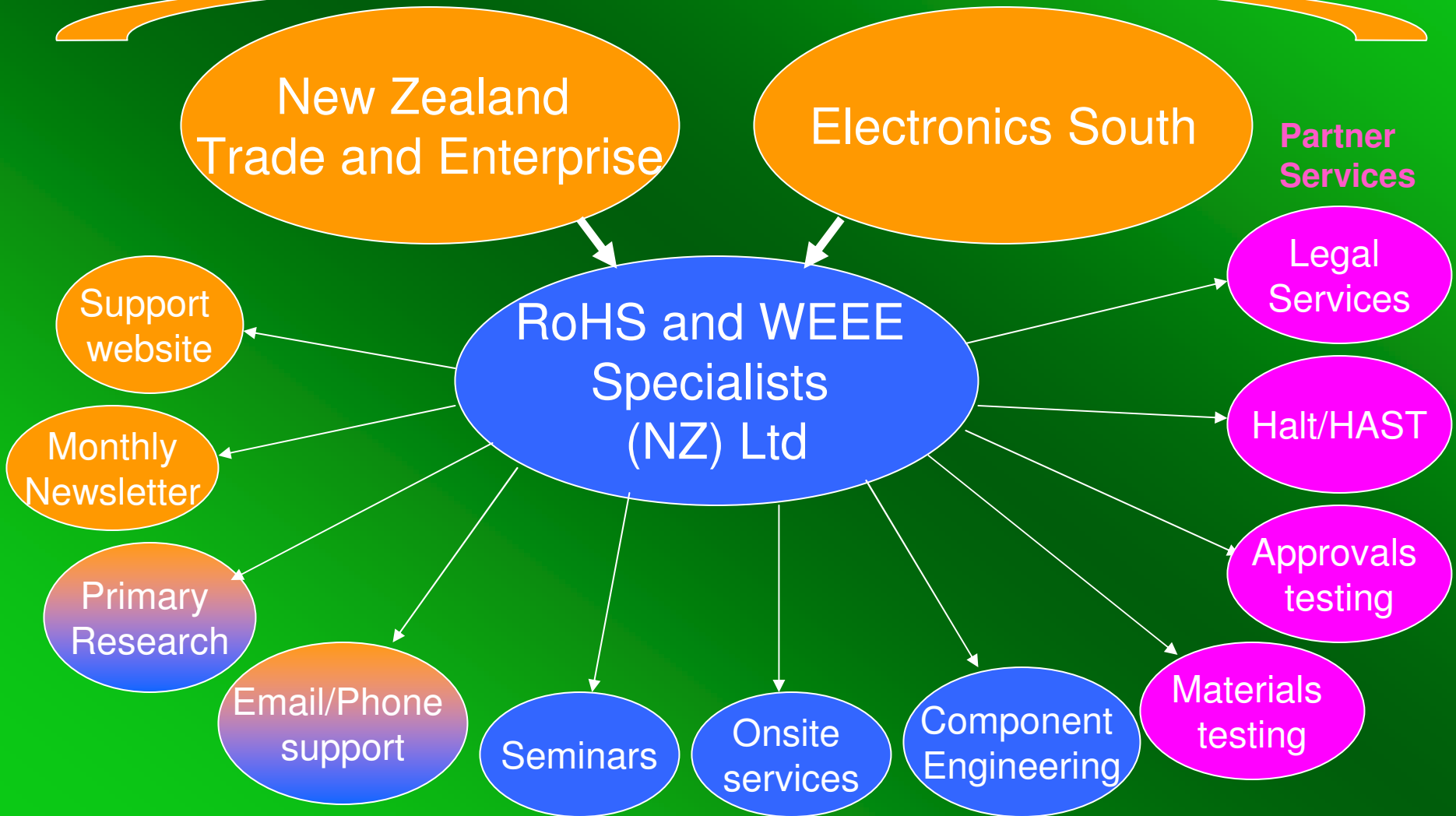


# RoHS and WEEE

New Zealand Support Infrastructure

# Basic Infrastructure

## New Zealand Government Funding



# Support Infrastructure funding

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## New Zealand Trade and Enterprise

- Fund website management and newsletter
- Fund ad hoc email and telephone support
- Fund venues for workshops on primary research

## Electronics South

- Fund website hosting
- Fund/organize marketing and publicity

## Support Infrastructure funding (continued)

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### Industry funds:

- Seminars
- Onsite services
- Component engineering
- Materials testing
- Email and phone support not covered by NZTE funding
- Primary research apart from venue costs for workshops.

# Web based public domain support

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[www.electronicssouth.com](http://www.electronicssouth.com)

Now rated in the top 10 on Google on a search on “RoHS and WEEE”

Best of Breed RoHS and WEEE site.

- Summaries of key documents
- Legislative interpretation
- Links to supporting material
- Email forum
- Primary research documents

# Web based public domain support

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[www.raws.co.nz](http://www.raws.co.nz)

- Commercial services
- Environmental argument and lobbying

# Industry Engagement

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Electronics South is keen to engage with its peers in the Asia region

Key areas of cooperation are, technology, trade, investment, research, knowledge sharing, industry experiences

# Industry Engagement

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Our key industry expertise is in:

- Green manufacturing process
- Electronic power management and switching
- Prototype design and development
- Satellite navigation
- Instrumentation and Calibration
- Leading edge innovative hardware and software
- Wireless communications
- Digital media
- Low volume high mix contract manufacture
- Used in Healthcare financial services marine, security, agriculture, mobile communications, transportation,

## Are these guys serious

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October 2003 – Dutch government halted shipments of Sony Play Station due to excess cadmium in its cables

Shipments resumed in mid December

Cost to Sony:

- EUR 110 Million on sales
- EUR 52 Million on operating profit

Root cause – supplier supplying cables out of spec

Source: Sony press release

# Questions and Contact Details

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## Questions?



Presenter Roland Sommer

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