Stirring Appetites in Design: A user Centered Product Design Approach to Improve Environmental Health in Remote Indigenous Communities in Australia

Christian Rainer-Maria Tietz, University of Western Sydney, NSW, Australia

Abstract: A case study uncovering the impact of use patterns of electric domestic indoor cook stoves leading to a user centered product design approach towards improving nutrition in Australian Indigenous Communities. This paper describes the research methods used to identify and uncover patterns of electric domestic indoor cook stove use and the resulting stove life expectancy in remote Indigenous communities. It highlights in detail user interactions with the appliances and identifies use, user and design assumptions being made when designing, specifying, ordering and installing mainstream appliances into non-mainstream environments. The level of infrastructure quality and maintenance & repair support play an important role in influencing the performance delivery and lifespan of the product, in at times unexpected ways. The relationship and interplay between use, environment and product performance is presented as a vital, important consideration in the design process. The discrepancy of expected versus actual product performance can in these cases have a direct impact on the users lifestyle and health that might not be apparent in a more conventional urban domestic setting. Currently this results in a 17 year gap in life expectancy between the average Australian and the Indigenous population (Dart 2008). This highlights the important role design can play in the delivery of improved environmental heath outcomes, in this case improving nutrition. The more remote the location, the more mission critical the design becomes in supporting a healthy lifestyle.

Keywords: User Centered Product Design, Use Patterns, Indigenous Environmental Health, Design Led Field Research, Cross Cultural Design, Niche Markets

Background

AS A DESIGNER, I have been working in the field of Indigenous Environmental Health in Australia since my graduation project from University of Technology, Sydney, Bachelor of Industrial Design Program in 1991. Since that time I have worked for the Centre for Appropriate Technology in Alice Springs, as a consultant to the Nganampa Health Council in Alice Springs and as consultant for HealtHabitat, Sydney, the leading operators in this field. Their methodology as published in Housing for Health (Pholeros 1993) spells out a detailed survey & fix approach. My work has ranged from product performance reports (Department of Families 2007), product testing regimes and product design solutions (Pholeros 1993) to contributing a chapter to the Menzies School of Health Research publication Environmental Health Handbook (Harris 2000). Some of my research has also repeatedly been cited in the National Indigenous Housing Guide 1st, 2nd and 3rd editions (Department of Families 2007). I have been part of numerous community survey and fix activities (see Housing for Health (Pholeros 1993)) working inside Indigenous

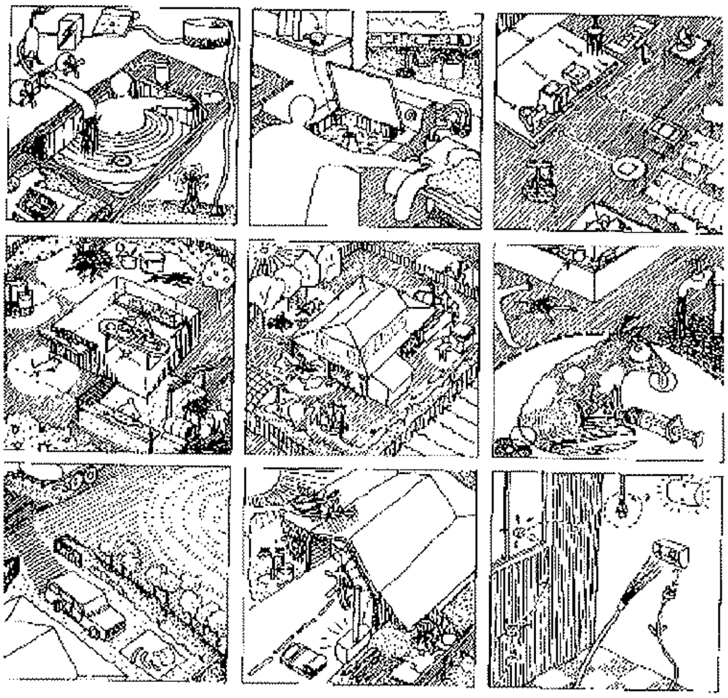
Design Principles and Practices: An International Journal
Volume 3, Number 5, 2009, http://www.Design-Journal.com, ISSN 1833-1874

Community houses, testing, assessing and fixing some of the over two hundred survey sheet line items per house. From testing electrical power outlets to door handles, lights, kitchens and cooking facilities inside and outside as well as around the houses.

It is from this practical experience that I am writing, it is not from an extensive review of previously published data in this field or from other academic writings about these issues. From my research to date there is no other data or other work in Australia that comes even close to the level of detail that has been collected by HealtHabitat, also I am not aware of any other Industrial Designers working in this field.

My work presented comes in part from working in my capacity as R&D manager in the FIXING HOUSES FOR BETER HEALTH PROGRAM (FHBH). The FHBH program is an Australian, federally funded project by the Department of Family and Community Services and Indigenous Affairs (FACSIA) roughly to about $12m dollars over 4 years (2006-2009). This head contract is administered by HealtHabitat (HH) who in turn has subcontracted selected consultants to carry out the highly detailed and thoroughly specified work of surveying and fixing about 3000 Indigenous community houses in suburban, rural, remote and very remote locations throughout Australia. This approach has been reviewed, assessed (SGS 2006) and subsequently been endorsed.

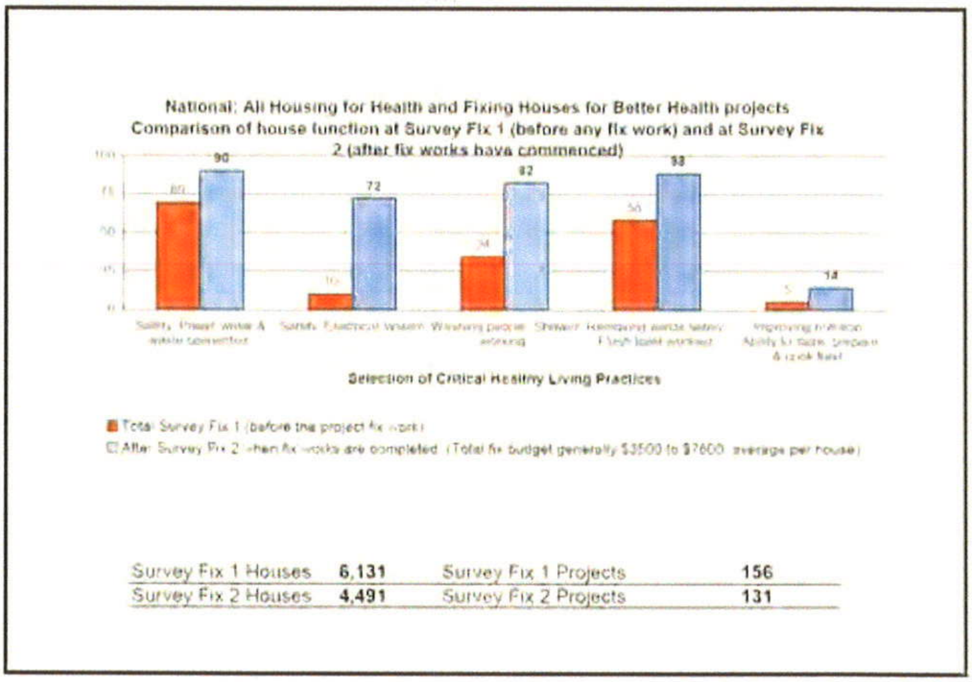
The basis for the work are the **Nine Healthy Living Practices**



1. Washing people
2. Washing clothes and bedding
3. Removing waste water safely
4. Improving Nutrition – the ability to store, prepare and cook food

5. Reducing the impacts of over-crowding
6. Reducing the negative impacts of animals. Insects and vermin
7. Reducing the health impacts of dust
8. Controlling the temperature of the living environment
9. Reduce hazards that cause minor injury (trauma)

The data collected since HH started to employ this detailed methodology in 1987 as the result of the Uwankara Palyanyku Kanyintjaku, A Strategy for Well-Being (UPK) report (Nganampa 1987) carried out by Nganampa Health Council, Inc, Alice Springs in the Anangu Pitjantjatjara Yankunytjatjara Lands in north-western South Australia, indicates the many shortfalls in Indigenous Housing performance. This existing data was the basis for the selection of the R&D projects for the overall FHBH program.



HH Presentation Slide at National Managers Meeting 22/8/8 in Sydney Showing Housing Performance

The biannual national FHBH Managers meetings were attended by the various Project managers and also by Government representatives and ministerial advisers. HH and managers presented project progress reports highlighting issues including the poor performance of kitchens and cooking equipment. HH data also showed that the ability to cook a meal in a house was very low. About 5% of houses had a working kitchen!

Especially indoor electric cook stoves seem to not last very long, perhaps 6-12 months at the most. (Chart below from an Arid Zone Housing manager)

STOVE TRIAL

CAMP ID	HOUSE #	1st stove	2nd stove	3rd stove
1	2	16/10/06		
6	9	18/10/06	11/5/07	14/7/08
6	15	19/10/06		
10	2	16/10/06	31/1/08	
10	5	10/10/06		
11	13	4/10/06		
13	8	-		
16	4	18/10/06		
16	5	20/6/06		
16	7	12/9/06	24/8/07	16/4/08
16	8	12/9/06	•2/02/2007	4/3/08
16	10	19/10/06		

Presentation Slide, (C. Tietz 2008)

The high repeated replacement and associated transport and installation costs were cited as a very cost intensive issue. Some practical and ad-hoc procedures to reduce the replacement cost were being discussed by various housing managers who manage often very tight maintenance and repair budgets. One such method to reduce costs was to order the stove with a suitable plug and to fit the houses with the correspondingly sized powerpoint in order to save on the call out and installation cost of the electrician having to hardwire the appliances into the domestic electrical circuit.

From these initial and anecdotal observations it became clear that we are dealing with a persistent and expensive problem. A proposal to investigate this issue further was prepared and accepted. The key findings from this activity are as per below.

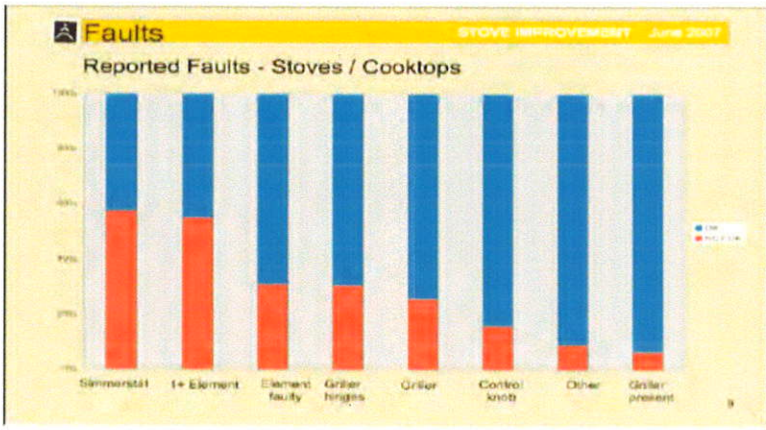
The Approach

The original proposal asked the questions
Why are the stoves failing and only have a lifespan of 6 – 24 months?
Are there common failures and if so what are they?
How can these problems be remedied?
This initial process was:

- Desk based research to consolidate information.
- Analyse existing data from H4H and FHBH consolidated databases.
- Collect further information on faults by qualified trades, including latest information from trades via logged job messages during the FHBH survey/fix in communities.
- Liaise with industry and NGO's to seek out any other applicable research information.
- Use all other available information sources to ascertain areas of fault.
- Examine presently specified models by area managers and Govt. departments
- Approach manufacturers to determine specifications and design.

The desired Outcome was to design and specify a type of stove / oven unit that would perform better and last longer.

The desk based research, drawing on analysis of real-time database information and trade feedback, identified a number of basic mechanical faults with the appliances. Common failures were found with simmerstats, knobs, and oven doors. Data charts were created and percentage failure rates were established.



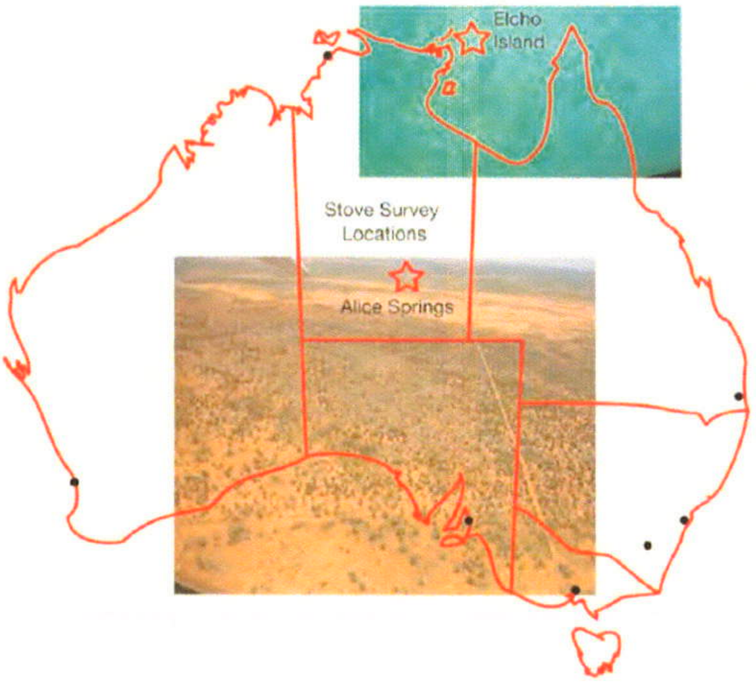
Presentation Slide, (C. Tietz 2008)

However what it did not provided was the problem context or any indication of why these failures were occurring. An understanding of the failure cause would help to address the problem at a deeper level instead of just treating the identified symptoms. (*"A Desk is a dangerous place to view the world" John le Carre)*

How to obtain actual stove use data? How to obtain stove churn data?

How do we get a somewhat representative user sample geographically and socially?

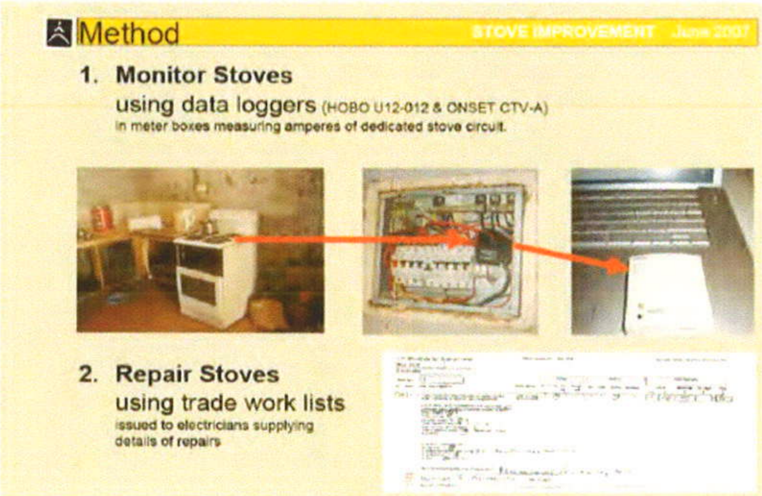
A practical method of gathering actual user data needed to be discussed and devised. The locations had to be geographically meaningful i.e. to represent a spread of typical operating environments. Like an arid dry zone, were the climate was dry, dusty, hot and had a big range of temperature variation and a second location that was tropical, wet & humid - coastal were the temperature would not fluctuate so much but there would be a high degree of humidity, salty ocean spray in the air and tropical temperatures.



These locations were chosen in conjunction with the FHBH survey fix projects so that a clear link to the program was apparent and to also make the visits more effective as at least two of them would coincide with survey fix activities.

Local area housing managers were consulted in regards to suggestions about a range of suitable houses. A spread of house population characteristics in terms of age, numbers of children and extended family would further provide the most representative sample. In all 16 stoves were being monitored. The tropical community provided four different houses and the arid zone 12 houses spread over a number of camps.

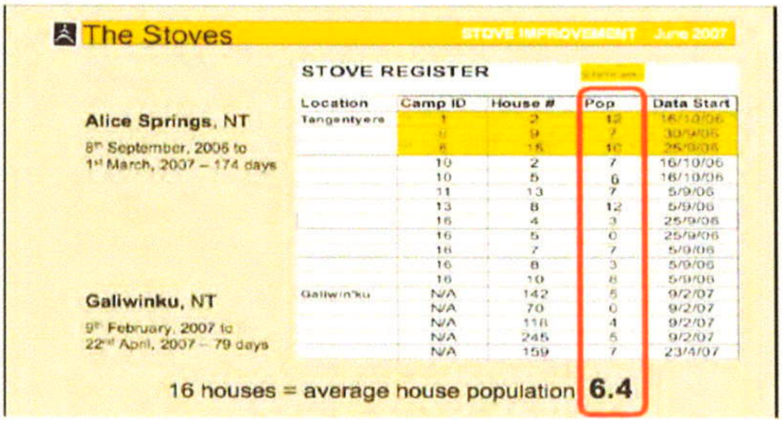
Data loggers were installed in the domestic switchboard and measured the voltage going through the dedicated stove circuit.



Presentation Slide, (C. Tietz 2008)

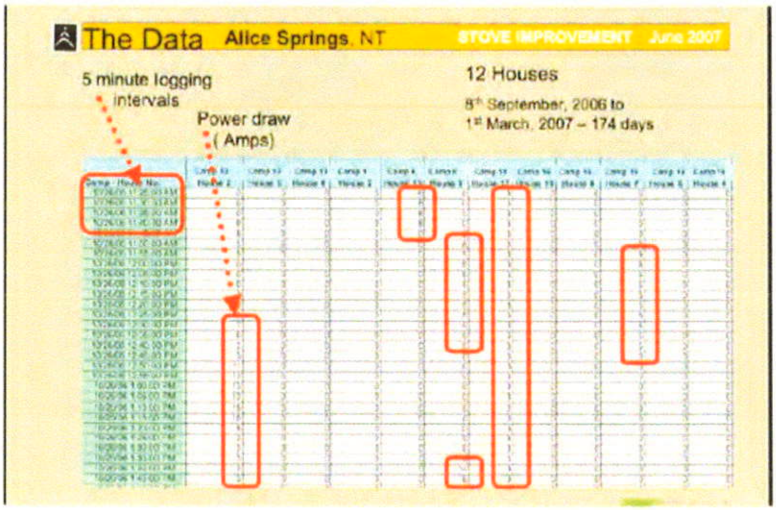
Every three minutes a data point was recorded. This interval required a 3 monthly field visit to download the data from the logger to the laptop. During the visits household population was also being recorded. This helped to establish whether the house was in use and by how many occupants. The trial period was set at one year to allow for a complete cycle of seasonal variation.

The results were revealing in many ways. Household population for example was on average 6.4 people per house with a peak of 12 and a low of 0. Compared to the national average of house population of 2.6 people in Australia (Australian Bureau Statistics 2001) we see a 240% variation. During survey fix activities house populations of up to 30 people using one house were recorded.



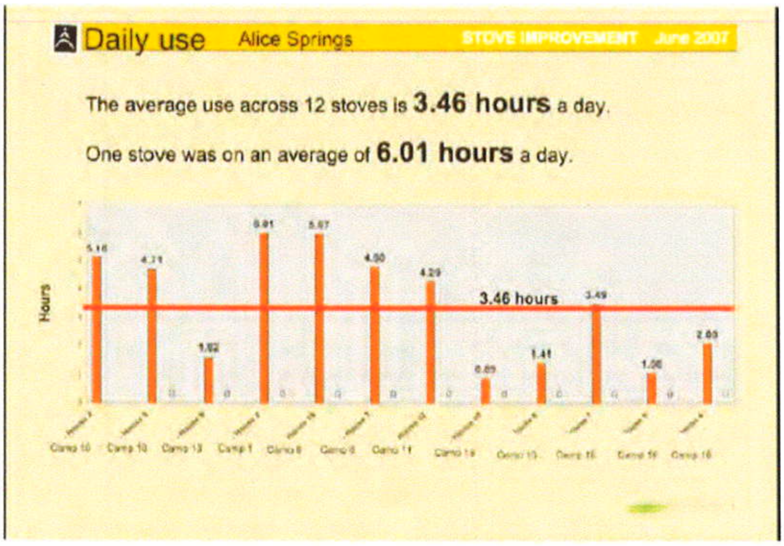
Presentation Slide, (C. Tietz 2008)

The processed data looked like the below example indicating stove on time and Ampere reading. From this it is possible to deduct how many stove elements are in use.



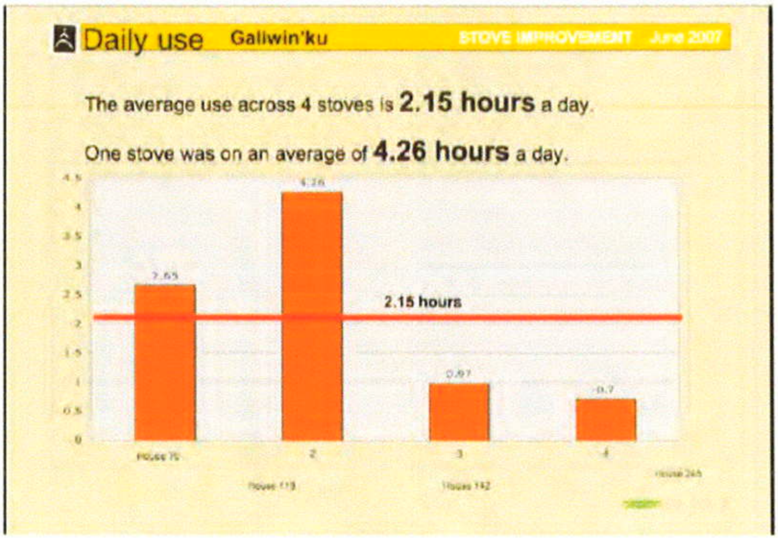
Presentation Slide, (C. Tietz 2008)

Using this data it was easy to calculate the average daily stove use in the arid dry zones



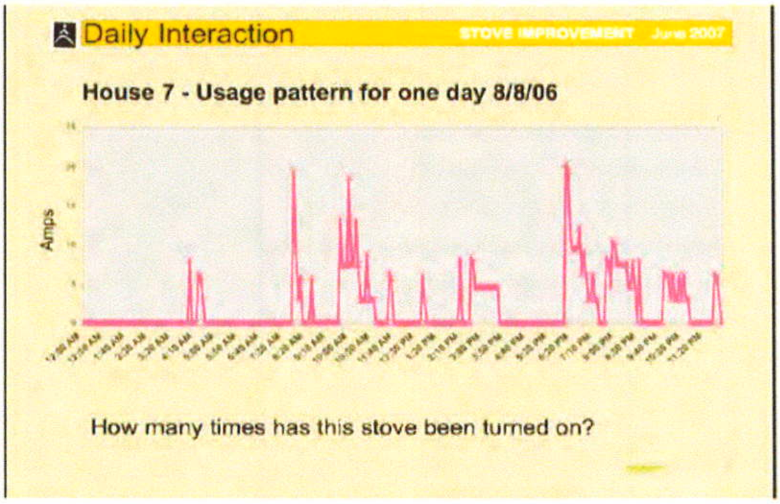
Presentation Slide, (C. Tietz 2008)

The average daily stove use in the tropical wet zone



Presentation Slide, (C. Tietz 2008)

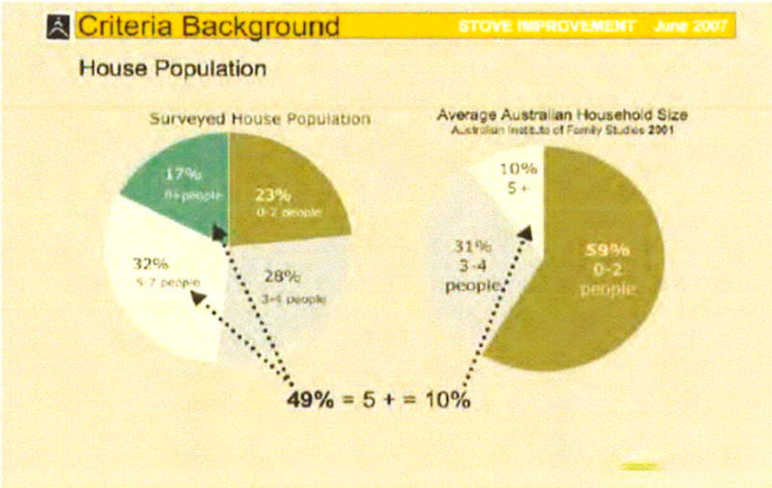
The recorded data also showed that user interaction with the stove was at times very high.



Presentation Slide, (C. Tietz 2008)

13 times a day as in the example above and up to 21 times a day were recorded results. It also provides quite a detailed record of when the appliance use occurs and for what amount of time at each instance and how many hotplates were in use.

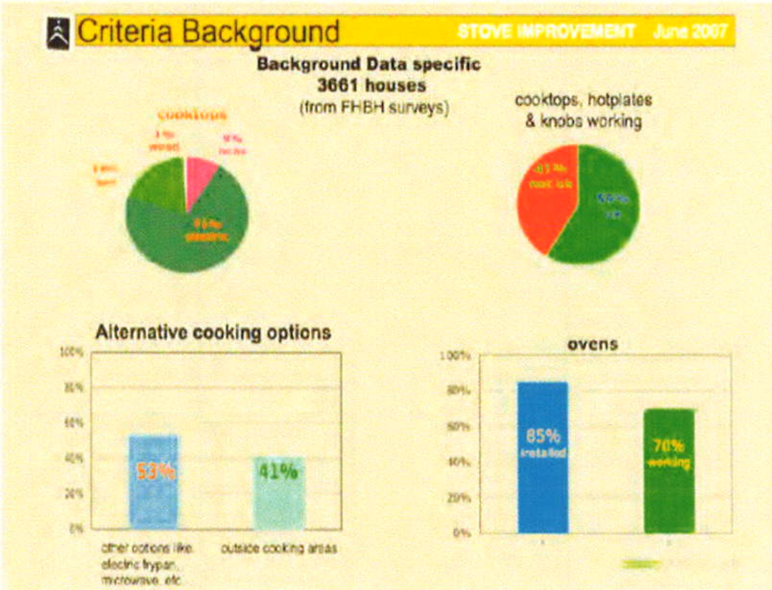
This information when compared to Australian Institute of Family Studies (2001) data,



Presentation Slide, (C. Tietz 2008)

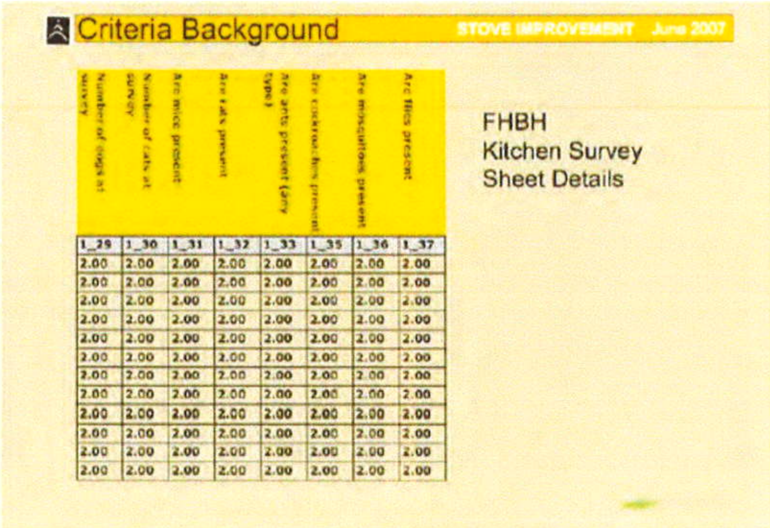
is showing a very different occupancy rate of the survey population in comparison to the national population figures. This is an indication of the level of service the stove appliances have to provide.

The FHBH data base was then mined deeper to provide more context about any cooking alternatives and predominant energy sources.



Presentation Slide, (C. Tietz 2008)

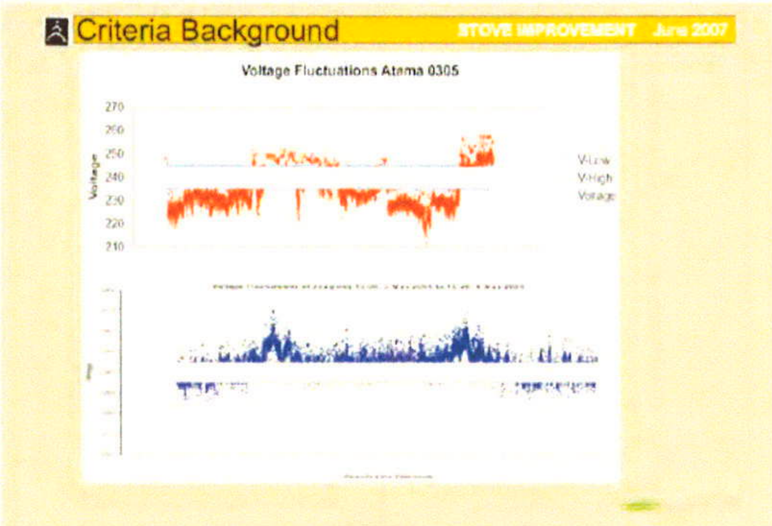
and further kitchen survey data was added to complement the emerging picture



1_29	1_30	1_31	1_32	1_33	1_35	1_36	1_37
2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00

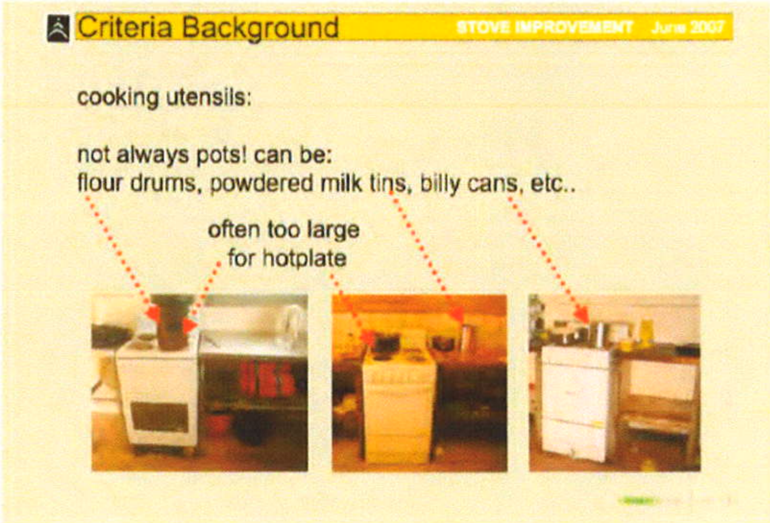
Presentation Slide, (C. Tietz 2008)

Information from other FHBH projects was integrated to help round out the context in which these appliances were being used. The infrastructure research group provided information on power fluctuations for power being generated by diesel generators.



Presentation Slide, (C. Tietz 2008)

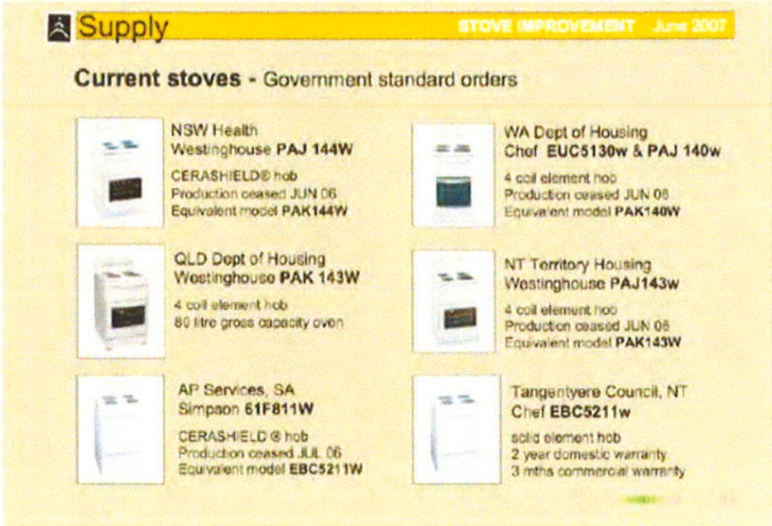
Photographic “worlding” documentation is showing the range of utensils being used for cooking.



Presentation Slide, (C. Tietz 2008)

Presentation Slide, (C. Tietz 2008)

The most common models used were the cheapest on the market in this case nearly exclusively from one manufacturer that owned a number of brands.



Presentation Slide, (C. Tietz 2008)

Conclusion

The information collected above provides a comprehensive picture of very detailed user interaction and the specific environmental conditions in which these appliances are expected to perform.

The field research provided a deep context and locates the basic mechanical failure indications into a wider systems setting that identified issues such as voltage fluctuations and chronic over crowding as major contributing factors to the short appliance life.

Also the high amount of user interaction and high duration of use of the appliance emerge as critical factors determining the lifespan of it. It appears that this kind of data was never considered when specifying and ordering the stoves.

The question that arises in my mind is:

How was it possible for the responsible authorities to keep on specifying the same product over and over again when it was clearly not performing to an acceptable standard?

When we met with the manufacturers of the appliances their designed use cycle for these stoves was rated at 5 hours per week. In our case we have found use of up to 6 hours a day with a daily average of about 3.5 hours this is 490% above the design load.

The designed product life is obviously not suitable for this kind of use. Similarly voltage fluctuations impact significantly on the life expectancy of the stove element as does the dusty and humid environment.

The specific user environment, when leaving the highly controlled, monitored and calibrated urban infrastructure, can be a vastly different environment from what we might automatically assume. It can be hard to anticipate all these factors when designing sitting at a desk in an urban office.

Field research conducted by the designer is an important part in the design process as it not only provides context but also helps collate the collected background and performance data into a rich picture for use in the design process, helping to make the design therefore more successful. Usually it is hard to do the field research as it is not only time consuming but also costly. In my case it took a number of years and numerous secondary flights in in regular transport service aircraft and also smaller and at times chartered aircrafts to get to the remote locations.

In my particular field of design this kind of 'on the ground research' provides good product performance insight that is also very helpful in addressing some of the misconceptions that seem to be prevailing about this particular segment of the user group.

In the field, while working and talking with maintenance personnel about the very poor stove performance, education was often raised as an important factor towards a possible solution. *"If we could run some workshops teaching them how to use a stove"* the appliances would last longer and be better looked after.

Even academic and design colleagues couldn't understand *"Why design for people that obviously don't appreciate things as they never seem to last?" " They trash stuff"*, etc...

The noteworthy point for me is that in these examples the fault seems to be lying with the particular user group. Social and cultural issues seem to become the paramount focus rather than the actual product interaction and use issues. Perhaps this is based on the assumption that the product is working fine for me therefore if a similar product is not working fine for *"them"* the fault must lie with *"them"* rather than the thing itself. When presented with the gathered data and hard evidence those responses dissolve and the issue is shifting again from the user to the thing. The thing is after all what we as designers and especially as Industrial Designers have the training and knowledge to improve through design.

References

Australian Bureau Statistics, A. 2001, *CHANGING DWELLING AND HOUSEHOLD SIZE* Australian Bureau of Statistics, viewed 6/10/2008 <*www.abs.gov.au/Ausstats/abs@.nsf/.../5f4bb49c975 c64c9ca256d6b00827adb!OpenDoc... -*>.

C. Tietz, G.N. 2008, *Stove Report*, Healthabitat, Blackheath.

Dart, J. 2008, 'Australia's disturbing health disparities set Aboriginals apart', *Bulletin of the World Health Organisation*, vol. 86, no. 4, (pp. 241-320).

Department of Families, C.S.a.I.A. 2007, *National Indigenous Housing Guide*, Third edn, Commonwealth of Australia, Canberra.

Harris, G. 2000, *Environmental Health Handbook: A Practical Guide for Remote Communities*, Menzies School of Health Research, Casuarina, N.T.

Nganampa, C.H. 1987, *UPK Report*, Pitjanjatjarra Council, Alice Springs.

Pholeros, P., Rainow, S, Torzillo, P. 1993, *Housing for Health, Towards a Healthy Living Environment for Aboriginal Australia*, HealtHabitat, Newport Beach.

SGS (ed.) 2006, *Evaluation of Fixing Houses for Better Health Projects 2, 3 and 4, Improving the lives of Australians*, vol. Occasional Paper Autralian Government, Families, Community Services and Indigenous Affairs, Canberra.