

CAMPAIGNING TO BAN THE FIREBOMB STOVES

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ABSTRACT

The South African government plans to ban substandard paraffin (kerosene) stoves that could save the country a major portion of the estimated R104 billion [1] a year externality cost of paraffin-related incidents. The Paraffin Safety Association of Southern Africa has been campaigning for mandatory stove standards since a series of South African Bureau of Standards tests it commissioned in 2003 found that nine of the most commonly sold paraffin stoves all had between five and nine serious problems. This paper describes the process undertaken to ensure the regulation of the industry and the identification of design alternatives that would support this move.

1. INTRODUCTION

Burns are a major public health problem globally. According to the World Health Organisation mortality data (WHO: 2002), there are at least 322 000 fire and flame deaths and millions of non-fatal burn injuries annually, the majority of which occur in developing countries [2]. However, the paucity of information on the extent of the problem in these low income countries as well as few coordinated prevention interventions and informal economic interventions has raised concern with the WHO and prompted them to embark on a Global Burns Project.

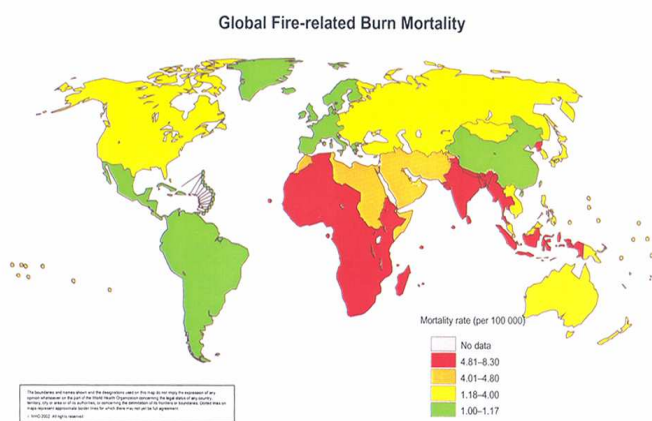
In South Africa, burns are the leading cause of death amongst young children (National Injury Mortality Statistics, 2002) whilst Figure one illustrates the extent of the problem globally. An important factor associated with burns is the impoverished living conditions of the vast majority of these victims, coupled with the use of paraffin as a household energy source. Households with unpredictable incomes tend to purchase energy for cooking, heating and lighting when cash resources are available, and thus a low cost, accessible fuel like paraffin is convenient and affordable. Poor households of necessity therefore have to rely on a potentially unhealthy and harmful fuel like paraffin for their daily survival. Studies have shown that despite the introduction of electricity, paraffin usage does not disappear; it only shifts in application. Thus it seems likely that the use of paraffin will prevail in many impoverished communities across the globe, certainly for the foreseeable future. This problem is exacerbated by the fact that none of the most commonly used paraffin stoves sold in South Africa meet the basic national safety standards.

In 2003, the Paraffin Safety Association commissioned a series of tests on the nine best-selling paraffin stoves [3]. All had serious problems. Key to reducing the negative consequences of paraffin usage therefore is the setting of a new, enforceable national standard for these cooking devices. It is the continued use of unsafe and sub-standard paraffin stoves to which the majority of runaway fires in informal settlements can be attributed. The improved standard can also successfully be applied to the subsequent re-engineering of these appliances.

To enable the identification of innovative alternatives, the Paraffin Safety Association set about challenging interested parties to design a safer, yet affordable cooking device through a nationally promoted competition. Response to the competition captured the nation's imagination and elicited entries from a broad spectrum of people including a number of international entries. The scientific testing of the prototypes generated will ensure that the recommendations for minimum standards to government are sufficiently encompassing, sensible and practical.

2. THE BURDEN OF POVERTY

According to a 2003 Treasury Report [1] the annual South African externality cost of paraffin-related incidents could be up to 50 times more than the annual turnover value of paraffin sold. The averaged retail price for the fuel is ZAR2,72 a litre (2004), and some 174 million litres of paraffin were sold in South Africa in the fourth quarter of 2004. Externality costs refer to the numerous social and



Fire-related burn mortality rates (per 100 000 population) in WHO regions, 2000

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Africa		Americas		South-East Asia		Europe		Eastern Mediterranean		Western Pacific	
LMIC	HIC	LMIC	India	Other LMIC	HIC	LMIC	HIC	LMIC	HIC	China	Other LMIC
5.5	1.3	1.17	8.3	8.2	1.0	4.0	1.5	4.8	1.5	1.1	2.0

HIC, High-income countries; LMIC, Low- and middle-income countries.

Figure 1. Fire-related burn mortality rates (per 100 000 population) in WHO regions, 2000

environmental problems such as health effects of pollution of air, water and soil, and ecological disturbance often not reflected in the market price of energy.

The Paraffin Safety Association's research showed that up to 40% of South Africans use paraffin for some of their domestic energy requirements. As long as paraffin remains an affordable and convenient energy source, people will continue to use it.

Providing formal housing may help prevent the rapid spread of paraffin fires but will not eliminate paraffin-related incidents. Poorly ventilated homes increase the risk of residents inhaling toxic fumes and contracting or exacerbating respiratory illnesses. To overcome the ventilation problem residents place paraffin stoves in open doorways, where they are easily knocked over, thus trapping the people inside.

However, stoves are not the only problem associated with the widespread use of domestic paraffin, as paraffin contaminated with petrol can cause appliances to explode. Yet there is little regulation and quality control of the paraffin once it leaves the refinery gates.

By its very nature, paraffin is dangerous as it is toxic and highly flammable. It is sold to consumers in any container presented. More often than not the container is a convenient household beverage bottle and the purchase transaction is often delegated to children. This practice continues despite the high incidence of paraffin poisoning which only occurs in very young children.

Even where poorer households have electricity, this is used to power appliances such as fridges, televisions or radios, while paraffin is used to cook meals and heat their homes. Liquid Petroleum Gas is often not an option as the initial cost is simply too high for many low-income households and accessibility is limited. There is no doubt that multiple fuel use is a characteristic of low-income households.

The Paraffin Safety Association invests a great deal of time and resources in educating users, who have no other choice but to use this potentially dangerous fuel, about safe paraffin use. Education is only part of the solution. There is little point in teaching someone to use paraffin safely if they are forced to cook on unsafe equipment using contaminated fuel in badly ventilated homes. This is where action is now needed before we are faced with another avoidable tragedy.

Regulation and enforcement of standards would prevent untold human suffering and save the country billions of rands. Instead of pouring money into disaster relief each year, investing in addressing the cause of the problem would provide a better return for the South African tax payer, and indeed in other low-income countries, coupled with a vast improvement in the quality of life for the poor.

3. ADVOCACY EFFORTS & RESPONSE

3.1 Release of the Stove Test Report

A high profile advocacy drive commenced with the presentation of the 2003 SABS Stove Test Report to a cross-section of related government and non-governmental organisations. These include the National Ministries of Health; Minerals and Energy; Education; Trade and Industry; Social Development; National Treasury; as well as provincial and local government to raise the awareness of paraffin safety issues and how they impact on those consumers whose lives continue to be characterised by poverty and underdevelopment.

3.2 Call for standardised incident surveillance

A simultaneous call was made to establish a standardised incident surveillance system to accurately record the extent of the problem and to determine exactly the triggers and chain of events that result in the devastation of many informal communities. Some communities experience frequent fires which could lead to the loss of their homes and all their belongings at least three times. Typically these communities have no form of insurance to assist in dealing with the unfortunate event. Households usually recover by withholding their financial support for their families in remote areas and thus the impact spreads to seemingly unrelated parts of the country.

3.3 Parliamentary Portfolio Committee engagement

In November 2003, a presentation was made to the Chair of the Portfolio Committee on Minerals and Energy at Parliament to encourage expediency in addressing the situation. Fact sheets were distributed to all parliamentarians to broaden the message.

3.4 Raising the public and media awareness

Reports of informal settlement fires are commonplace in most dailies throughout South Africa, and yet these were largely unheeded. The Paraffin Safety Association set about informing the general public of the cause and effect relationships, emphasising the impact on the fiscus.

The media's role was highlighted during a shack fire simulation held on National Paraffin Safety Day, June 2004 at the Wingfield facilities with support from local fire and emergency services. Media were called-upon to investigate and report on the factors surrounding fire events and to advise their audience on safe practices. In this way, public pressure was brought to bear on the responsible government departments to take action as the situation is largely avoidable.

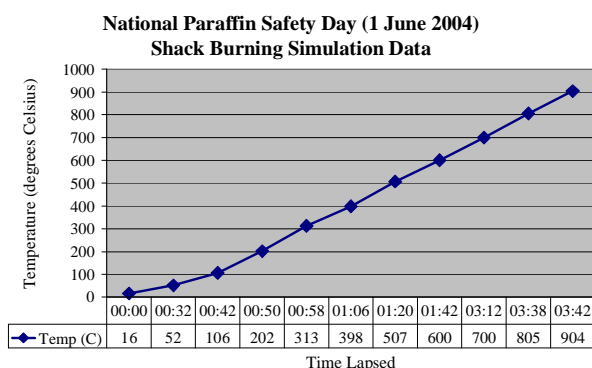


Figure 2: A stove was left cooking for 1 hour and then knocked over. Heat sensors were then used to monitor the changes in temperature. The rapid rise in temperature emphasized the degree of danger associated with the use of paraffin stoves.

3.5 Department of Minerals & Energy act decisively

During the budget speech in Parliament in June 2004, the Minister for Minerals and Energy committed government to the enforcement of mandatory standards by the end of 2004.

4. NEW STANDARDS DEVELOPMENT

4.1 Problem Statement

In 2003, the Paraffin Safety Association commissioned a series of tests on the nine best-selling paraffin stoves [3]. All had serious problems. Every wick-based stove immediately burst into flames when knocked over. Five leaked paraffin when lying on their sides. Some even leaked paraffin during normal use. The tests also found that in some instances the temperature of the fuel in the reservoir exceeded 80 degrees Celsius, well above the minimum 43 degree flashpoint of paraffin. In addition most stoves were sold without any or adequate instructions on its safe use and maintenance

Drafting of a new standard also offered the opportunity to address the consequence of asphyxiation and indoor air pollution that result from the stove's inefficiency.

4.2 Pitfalls of the current paraffin stoves

Manufacturers commonly overlook the following of the South African National standard (SANS 1906):

4.2.1 Fuel container

The joints below the maximum fuel level should not allow leakages and as specified the normal capacity shall conform to the working capacity of the stove. Due to the associated risk there shall be no accumulation of fuel on top of the fuel container, as have been experienced. This leads to inefficiency and increase in fuel costs [4].

4.2.2 Fuel temperature

High fuel temperatures increase the probability of igniting during use and thus the fuel temperature should always conform to the set standards/specifications [4].

4.2.3 Combustion

The carbon monoxide-oxygen ratio should be kept low, especially considering the fact that most consumers use the product for a long time or misuse the product, for heating purposes leaving it for the whole night in some instances [4].

4.2.4 Instructions

Considering the high illiteracy rates, instructions and warnings written *and in pictograms* are important for understanding, and the safety of the consumer [4].

4.3 The development process

The Paraffin Safety Association's first priority was to participate in the South African Bureau of Standards (SABS) process to update the voluntary standard SANS 1906 of 2003 for Safety of Non-pressure Paraffin Stoves and Heaters as it represents the majority of the market at 70% of total sales. Around 1 million units of the non-pressure stoves are sold each year into South Africa with an average cost of ZAR25 (US\$4).

What's more, it is evident that the pressure stoves are equally unsafe with evidence of the negative impact drawn locally and from sources in India where these stoves are more commonplace. SANS 1243 of 1979 for Pressure Stoves and Blowlamps will be addressed following the completion of the non-pressure appliance standards.

4.3.1 Economic impact assessment

Prior to SABS convening the technical committee to address the situation, SABS Regulatory and Consumer Protection (RACP) division commissioned an Economic Impact Assessment in June 2004. RACP is responsible for administering and regulating technical regulations on behalf of legislators of both National and Provincial Governments. According to their document, the assessment was conducted with the aim of, among others:

- Assessing the need for a regulation;
- Identifying the viability of other means of addressing the problem of accidents;
- Proposing a technical regulation to the Minister for Trade and Industry;
- Ensuring that the SABS has studied the cost of the regulation and other implications;
- Assessing the Impact on business, society and the environment;

4.3.2 Situation Analysis

There are two voluntary standards, namely SABS 1243 of 1979 for Pressure Stoves and Blowlamps; and SANS 1906 of 2003 for Safety of Non-pressure Paraffin Stoves and Heaters. These standards are widely criticized and incomplete in dealing with the safety critical issues relative to paraffin-stove incidents [4]. Producers seek to minimize cost by producing cheaper products, thus maintaining or expanding market share. Cheaper products are normally inferior and do not meet the minimum standards of the above voluntary specifications. A new specification is therefore required.

Useful facts included the approximate 2 472 003 households that use paraffin related products and these are to a large extent paraffin stoves, according to STATS SA, June 2004. The average annual income of these households is ZAR 12 679. It states further that the economic situation is at the heart of the use paraffin stoves.

It is clear that a market failure does occur in the making, selling and using of the paraffin stove [4]. There is little incentive for producers to manufacture a product that is safe for use. Other options have proven to be unsuccessful and ineffective.

Currently, the average lifespan of the stoves is between three to six months, so a household needs to purchase a stove up to four times in a year. However, this is generally not the case, as evidence shows that low income households continue to use the stoves way past the stipulated lifespan of the product, exacerbating the problem.

4.3.3 Impact of regulation on stove price

The assessment argues that the introduction of the technical regulation will likely set in motion two effects: 1) the price of the product increases and 2) the life span of the stoves also increase. Therefore by setting stringent and compulsory safety standards the frequency with which stoves are purchased in a year is reduced. This will have the advantage of off-setting the impact of the increased price level. To the extent that, technical regulation improves the quality of the product, there is a *prima facie* case for technical regulatory measures to be stipulated and enforced.

4.3.4 Assessment findings

As long as there is a lack of security of tenure as in the case of informal settlements, investment in portable solutions will be favoured over more permanent options. It is better to regulate the use of paraffin stoves, than to act upon the damage that is caused by the unsafe use of paraffin stove. The damage that is caused by the unsafe use of paraffin stove is not in terms of monetary value only.

4.4 Drafting of the standard

Improvements to the standard have been drafted involving the input from various stakeholders including universities and technologists; paraffin stove manufacturers and distributors; industrial designers; the Mauritius and Zimbabwean Standards Bureaux; government; two non-government organisations and SABS. By the end of 2004, the working group reporting to the technical committee had drafted the standard. This draft went for comment to the technical committee early 2005. Once comments received have been addressed by the technical committee, the document is subject to a SABS internal edit.

4.4.1 Public participation opportunity

The draft standard is open to public review for a period of 60 days (this is to ensure compliance with the World Trade Organisation / Technical Barriers to Trade Agreement [WTO/TBT] guidelines) once it has been accepted by the national technical committee. Once comments have been attended to by the technical committee can this draft be published as a National standard. Adherence is still voluntary at this point.

In the interest of public health and safety, consumer protection and the environment, the Minister of Trade and Industry may declare a specification to be a compulsory specification (technical regulation) and in order to enforce the standard, it needs to be regulated. A procedure, in accordance with the WTO/TBT guidelines will have to be observed.

5. SAFE STOVES DESIGN COMPETITION

5.1 Rationale for the competition

The Paraffin Safety Association is well aware that there is no point in banning the existing stoves without providing an alternative, which is why they teamed up with Proudly South African to offer a ZAR 500 000 in prize money for designing a safer cooking device.

Proudly South African is a campaign to promote South African companies, products and services which are assisting in creating employment and supporting economic growth in our country

The purpose of the Paraffin Stove Design Competition was to identify potentially safe, functional and cost-effective designs that have the potential to replace the existing unsafe stoves in the marketplace. And, to set new standards for safe paraffin stoves in South Africa.

The competition further enabled The Paraffin Safety Association to test the feasibility of the new stove standard being drafted by SABS whilst offering support for the government commitment to this regulation.

5.2 Forging strategic partnerships

August 2004 saw the launch of the Paraffin Stove Design Competition. This event took place at the Council for Scientific Research (CSIR) in Pretoria. Key officials; fire and emergency services; SABS; universities; technologists and media were invited to witness a live simulation of a shack or informal dwelling fire triggered by a non-pressure stove being knocked over after one hour of boiling a pot of water. CSIR provided the expertise to set-up, monitor and record the ambient temperatures, time lapse and visual information. The Tshwane Fire Services were on hand to ensure the safety of the audience.

An independent forum of experts had previously been convened to advise on the structure and conditions for entry as well as to set the criteria for judging. This panel included mechanical and chemical engineers; industrial designers; fire forensics; a consumer forum; and a SABS design institute representative. Due diligence was observed in order to address any legal consequences which a prizes to the value of ZAR500 000 would attract. Pro Bono advice on intellectual property was on offer from patency attorneys Adams & Adams to potential competition entrants.

5.3 Competition structure

The structure of the competition encapsulated a range of scenarios in order to draw in practical manifestations of potential solutions. Top prize is to the completely new design idea, with prizes for the best design elements or components, a re-engineering of current stoves, the most promising young designer as well as spot prizes for the most innovative and sustainable designs.

5.4 Entry response

Supported by an extensive national media campaign, an impressive 86 entries were received during the first phase that required submission of the technical specifications by November 2004. The competition had a minimum requirement of a working prototype which is a costly and resource intense exercise. Entries were attracted from across South Africa, India and USA, the youngest entrant being two 14 year old school girls and the oldest being two pensioners.

The deadline for a working prototype of the stove design was February, 2005. A total of 35 out of the possible 68 prototypes were received following the first level judging in December 2004.

5.5 Judging the prototypes

The independent panel of judges will be convened for further evaluation of those submitted in order to shortlist 15 prototypes to be laboratory tested (The judging was incomplete at the time of writing the paper). Sasol Oil reached new frontiers when they offered their laboratory

facilities at Sasolburg to undertake this crucial step in determining the best of the prototypes.

Once the shortlist of prototypes is determined, the laboratory testing will take approximately three weeks to complete as each unit is unique in its materials, design and operation. The successful prototypes will then finally be re-evaluated and the prize-winners will be determined.

5.6 From concept to product

However, to ensure that the designs realize as products on the shelves for the consumer, a negotiated contract will be put in place prior to awarding the prizes which will highlight the structure of the prize money and the relationship between the designer (and/or patent holder), and the Paraffin Safety Association. This step is necessary to progress product development. It may occur that an existing product with existing production capacity is identified or a design idea needs to be linked to manufacturing capacity and funding sources. Announcements of the winners should be possible in April / May, 2005

5.7 Linking to the standard

Four members of the SABS technical committee form part of the judging panel for the competition and will gain insights of the design alternatives that could be marketed both regionally and internationally after the regulation is in place.

6. CONCLUSION

The energy sector is at the heart of structural developments in the economy [5] which is key to the economic growth of a country. The South African Government can be applauded for the bold steps to regulate the paraffin stove manufacturing industry notwithstanding the many other challenges it faces. The savings on relief funding could be better spent addressing issues such as HIV/AIDS, housing and education.

Sustainable development requires improved energy services for everyone, but particularly low-income communities where the need to break the cycle of poverty is most urgent.

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The Paraffin Safety Association is a non profit organization. It was started in 1996 by oil companies operating in South Africa who remain its funders. It is the only industry-sponsored, paraffin safety programme in the world.

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Presenter:

The paper is presented by Teri Kruger.