

## Outcomes of the SmartShape™/SmartStretch™ Meat Science Project

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**Abstract.** SmartShape™/SmartStretch™ is technology that uses air pressure to shape meat into an even form and to stretch hot-boned meat to prevent muscle contraction during *rigor mortis*, which produces more tender meat. A project that was designed to research the ability of the technology to create more tender meat and to introduce the technology to industry was conducted from April 2007 to June 2011. Varied success in research results and the needs of industry have shown that the SmartShape™ function, which shapes pieces of meat into an even and easy to manage form, is of most value to industry. The technology is being adopted by a major Australian beef processor and will be commercialised in late 2011.

**Keywords:** SmartShape™, SmartStretch™.

### Introduction

SmartStretch™ technology was developed under a joint externally funded Meat & Livestock Australia, Beef & Lamb New Zealand and Meat Industry Association New Zealand research program to stretch hot-boned muscles pre-*rigor*, and to package those muscles to prevent them from contracting during *rigor*. Preventing muscles from contracting at *rigor* has been shown to result in more tender meat, reducing the need for ageing (Simmons et al. 1999) and potentially improving the tenderness of muscles prior to freezing.

SmartShape™ is based on similar technology. This technology solely focuses on shaping the muscle after *rigor mortis* into a consistent form. This has advantages for portion control, allows for more consistent cooking times, reduces trimming wastage and reduces storage and transport space. These are important considerations for food service providers (Hopkins 2010). The advantages of SmartShape™ are also relevant to SmartStretch™.

SmartShape™/SmartStretch™ was developed and patented in New Zealand and projects to research the technology and facilitate its commercial adoption were run concurrently in both Australia and New Zealand, with work in the latter country ceasing in 2010. In Australia the project had two components:

1. Research to validate the ability of the technology to improve the eating quality of hot-boned meat.
2. Demonstrations and technical support to industry to facilitate the adoption of the technology.

### SmartShape™/SmartStretch™ technology

SmartShape™/SmartStretch™ technology is centred on a flexible rubber sleeve that is surrounded by airbags and housed within an airtight chamber. When air is pumped out of

the chamber the rubber sleeve expands allowing a boneless piece of meat to be inserted. The meat is always inserted into the rubber with the grain longways. Air is then pumped into the airbags, compressing the meat. Air is pumped into the airtight chamber, providing more compression and forcing the meat out of the rubber into packaging via a peristaltic action. The end of this process is shown in Plate 1.

### Research

Early experiments on pre-*rigor* hot-boned sheepmeat showed that by using SmartStretch™ technology a significant improvement in meat tenderness could be achieved compared to control treatments (Toohey et al. 2009; Toohey et al. 2008). Toohey et al. (2008) found that SmartStretch™ treatment at 0 days of ageing improved tenderness to such a degree that sheepmeat topsides had a consumer acceptance of 95%. In contrast, the control treatment had a 0% consumer acceptance when the criteria for acceptance was based on a shear force value of 49 Newtons (Shorthose et al. 1986). Although a less dramatic result was found in topsides when the SmartStretch™ treatment was applied to the whole boneless leg, the meat was still significantly more tender after 0 days ageing (Toohey et al. 2009). There were no negative impacts on other important meat characteristics (e.g. colour). Likewise, a project involving hot-boned muscles from grainfed cattle with a maximum dentition score of 2 showed that the technology had the capacity to improve tenderness in beef equal to other stretching technologies, such as Tenderstretch (Geesink and Thompson 2008). This led to the belief that the technology would be able to meet expectations.

Subsequent experiments in commercial beef hot-boning abattoirs on cast-for-age cattle found that stretching of meat pre-*rigor* had

little impact on the tenderness of beef (Toohey et al. 2010a; Taylor et al. 2010). Toohey et al. (2010a) found that stretching a beef topside to increase its length by 52% had no more tenderness gain than stretching the topside to 34%. Poor stretch was achieved in the cube roll and no benefit in tenderness was found from a length increase of 9%. No significant tenderness gains were found when beef topsides and rosbifffs were stretched to increase their length by 21% (Taylor et al. 2010). Reported work by Toohey et al. (2010b) found a significant improvement in tenderness in the unaged striploin. Any benefit had diminished with ageing. It was concluded that the lack of improvements in meat tenderness may have been due to the increases in connective tissue of the aged cattle.

Further experimentation with younger animals was conducted to quantify the potential benefits of SmartStretch™ technology for beef. Significant tenderness improvements were realised from unaged, stretched rosbifffs sourced from beef cattle with a maximum dentition score of 2 (Taylor et al. 2011a). This suggests that the technology has the most benefit when using a high quality product.

Later work comparing the impact of SmartStretch™ and electrical stimulation on the tenderness of the sheepmeat topsides found that electrical stimulation had no impact on tenderness although stretching improved tenderness in the unaged product and after 5 days ageing (Toohey et al. 2011). Other work on sheepmeat loins revealed similar results, with a tenderness benefit from stretching after 5 days ageing (Taylor et al. 2011c). These experiments confirm the results of the early sheepmeat studies.

The positive response from industry into the consistent shape of the SmartShape™ treated primal resulted in an assessment of shape retention in steaks cut from shaped cube rolls (Taylor et al. 2011b). It was found that shaping changed the dimensions of the steak from uneven to circular, as shown in Plate 2. This shape was retained until after cooking, where the edges of the steak relaxed out to a more natural appearance. This will allow for steaks that are portioned both on weight and dimensions and will be of interest to the food service industry as consistent steaks will allow for consistent preparation and cooking.

## **Industry**

### **Adoption**

The technology was demonstrated to 27 companies in five states (Queensland, New South Wales, Tasmania, Victoria and Western Australia). The SmartShape™ function of the

machine was the most promising commercially. Four companies accepted the opportunity to undertake on-site product development to meet customer needs as part of Meat & Livestock Australia's Meat Donor Company projects and, of those, two beef processing companies showed interest in progressing to the next stage. One company purchased a machine for shaping specific beef primals to meet the requirements of a food service customer. Another company may proceed with the technology in late 2011 for use on hot-boned product.

### **Feedback**

Most companies appreciated the real potential for the shaping component of the technology. SmartShape™ produces consistent pieces of meat, as shown in Plate 3, which has advantages for portion control preparation of slices with minimal wastage. The consistent shape also has advantages during the cooking process if the primal is cooked whole or sliced as this ensures more even cooking. As with all value added product, SmartShape™ must attract a premium to be viable and a number of companies did not adopt the technology because their customers were unwilling to pay a premium. Regardless of this, interest in SmartShape™ remained strong, and valuable feedback to facilitate the commercialisation of the technology was received. This feedback included ideas for speeding up and automating the processes for integration into the processing chain.

The technology was also showcased internationally through presentation at conferences (Toohey et al. 2010a).

### **Future**

Following the adoption of the technology by one major processor it is expected that SmartShape/SmartStretch™ will be commercialised by the end of 2011.

A major review of all the patents and technology on stretching and shaping was published by Taylor and Hopkins (2011).

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**Appendix**

Plate 1. Shaped and stretched beef being ejected from the rubber sleeve into packaging

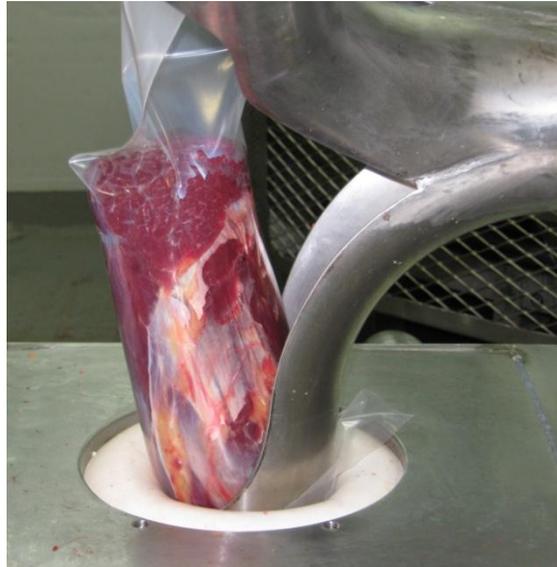


Plate 2. Steaks from SmartShape™ treated cube roll (left) and untreated equivalent cube roll (right)



Plate 3. Shaped beef and lamb.

