



Adande® refrigeration technology comparison
with conventional refrigeration solutions
at Westminster Kingsway College



Westminster Kingsway
central London's College

Quotes



“ The experiment really showed a difference in the efficiency of the fridges. The report will enable us to show existing and future students the importance of fridge management and purchasing of kitchen equipment.

The experiment also really showed that the Adande® delayed deterioration of different types of fish with significant moisture retention and flavour against the other fridge used in the experiment. ”

Miranda Godfrey
Course Coordinator
International Culinary Arts Diploma
Westminster Kingsway College



It's an Adande®; it works like no other fridge or freezer...

Quotes



“The differences in the fish at the end of the trial was really quite noticeable, visually I could see immediately that the under counter fridge fish had dehydrated far more than the Adande® fridge fish without the need to weigh them on the scales. This in turn will alter the texture and flavour of the fish, to the point that decomposition in the more delicate items (prawns) were evident, the heads had begun to turn black and they had a strong unattractive smell.

When we cooked the fish the taste was fresher throughout the Adande® fridge fish with the under-counter fish having a stronger fish taste, less moist and more fibrous and some items, the prawns and haddock fillet, so unattractive as to warrant not cooking at all.

In general, the fish kept in the Adande® had not dehydrated and coupled with the stable temperature had enabled the fish to be kept fresher for longer (longer shelf life in optimum condition) in comparison with the under counter fridge fish.

I also noted that had the fridges been in a perpetually hotter kitchen the under-counter fridge temperatures would have fluctuated far more which would have made the differences more pronounced.”

Nickolas Melmouth-Coombs

Executive Chef

Fish! Kitchen

It's an Adande®; it works like no other fridge or freezer...



What's the Problem?



- Fresh fish is a highly perishable product and to maximise its value the freshness and quality must be maintained. Once lost, freshness cannot be regained
- Every 5°C rise in storage temperature, the fish 'shelf life' more than halves
- Fresh fish should be stored between -1°C and +2°C to best maintain quality
- 4°C is the maximum storage temperature for fresh fish
- Temperature stability is imperative

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Purpose of Trial



- Establish a baseline quality comparison between fish stored in the **Adande®** and a **Conventional** under-counter door cabinet
- Correlate storage temperature and humidity with product quality
- Provide valid feedback from an independent organization/renowned chef on the fish (raw and cooked)
- Determine product weight loss over an extended storage period

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The Outcome



Adande[®] significantly outperformed conventional refrigeration in side-by-side tests:

- Visible difference in fish quality at the end of the storage period
- Adande[®] maintains fish freshness for longer and has a direct impact on final cooked product quality
- Adande[®] samples tasted fresher – conventional samples were dry, unappealing and in some cases inedible
- 30% less reduction in value and therefore less waste too with Adande[®] technology

Why is Adande[®] different?

- Cold air stays in the drawer maintaining stable temperature
- Low air flows minimises dehydration on the surface of the product

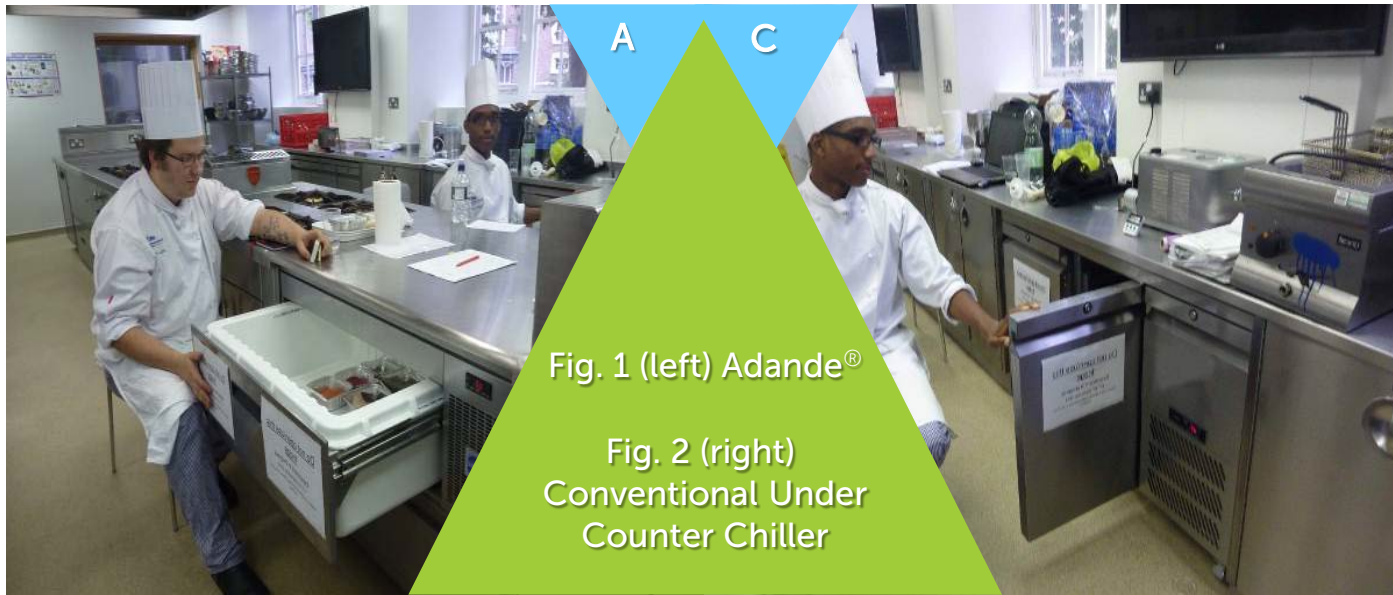
It's an Adande[®]; it works like no other fridge or freezer...

Test Conditions



- Each fish species was placed in an individual container, weighed at the beginning and end of the trial to monitor weight loss due to dehydration/deterioration
- Storage temp was set to 1°C on both refrigeration appliances. Air temperature and humidity were recorded with data loggers
- No ice was used
- Photographs were taken at the beginning and end of the test
- A human sensory assessment (sight, smell and/or touch) remains the fastest and most accurate method of assessing fish freshness

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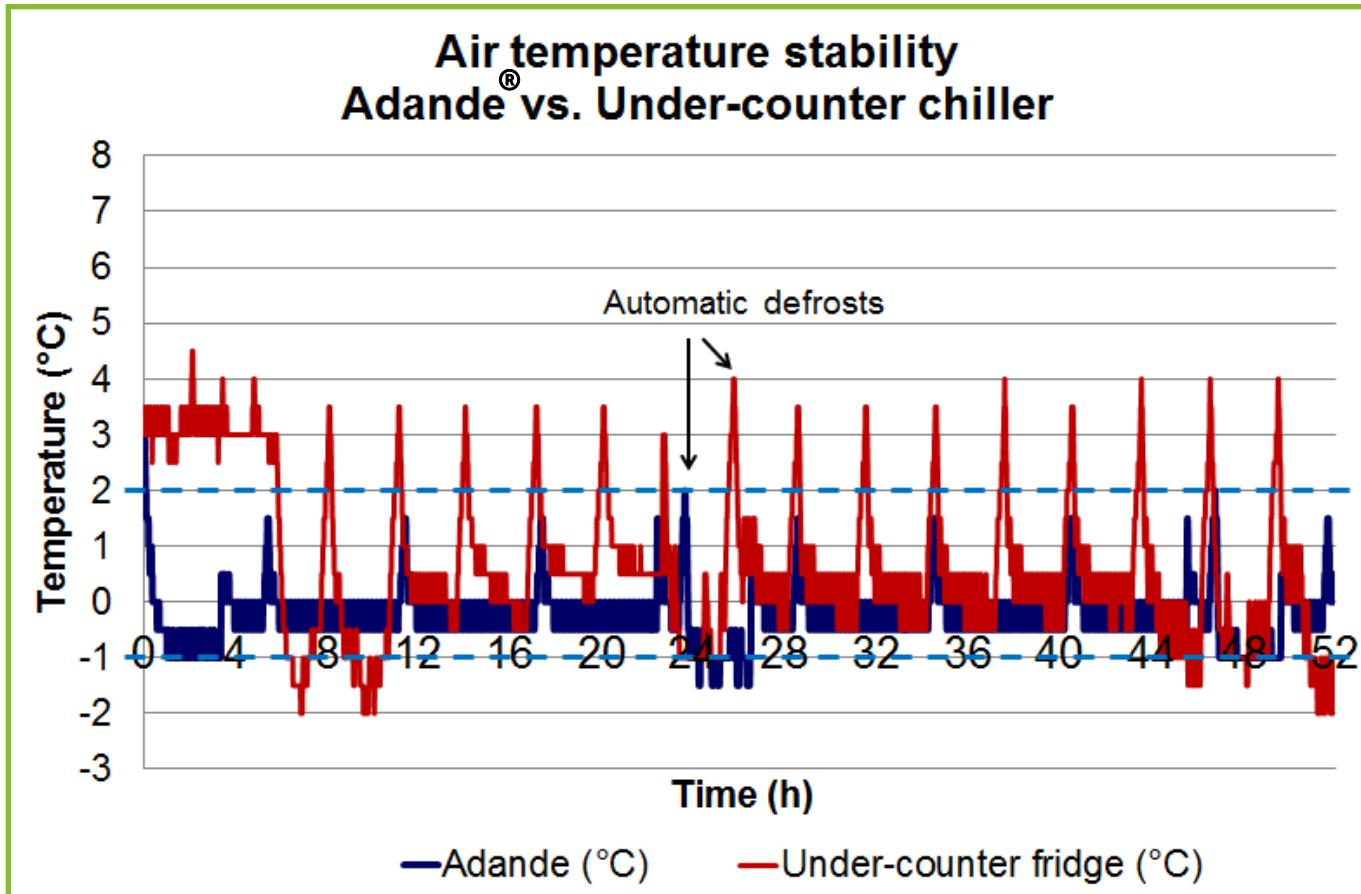
- Day 1 4 hours of drawers/doors openings every 3 min for 7 sec
- Day 2 4 hours of drawers/doors openings every 2 min for 12 sec
- Day 3 2 hours of drawers/doors openings every 3 min for 12 sec
followed by
2 hours of drawers/doors openings every 5 min for 12 sec

Ambient temperature was maintained at approx 20°C

Products were left uncovered to test product shelf life
under extreme conditions

It's an Adande®; it works like no other fridge or freezer...

Results – 52 Hour Period

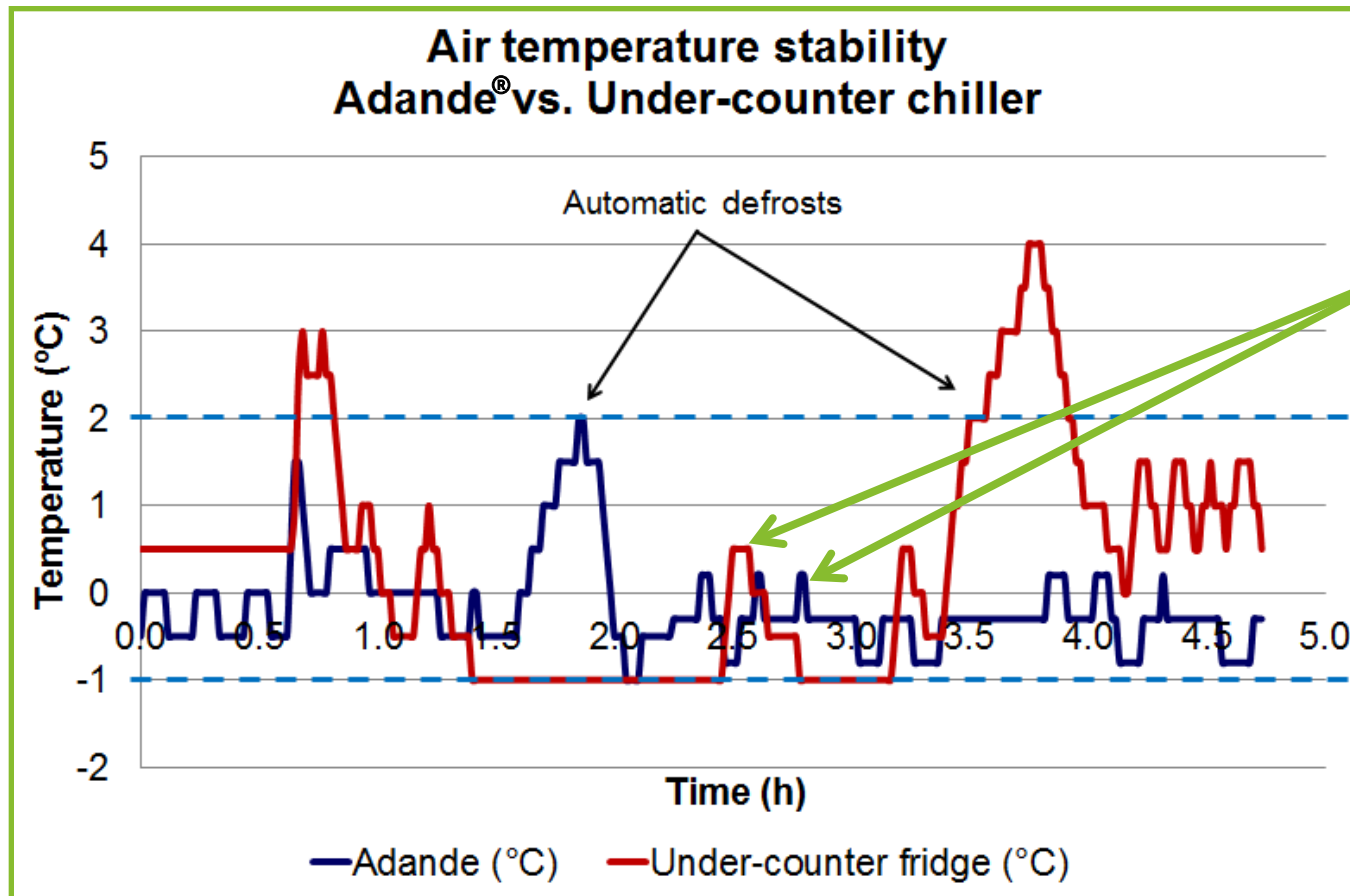


Total 52 hour
test period

So, just what's happening? Let's take a closer look...

It's an Adande®; it works like no other fridge or freezer...

Results – 5 Hour Sample



Peaks show
typical
drawer/door
opening

Optimum holding
temperature range

Adande® technology guarantees stable temperatures

It's an Adande®; it works like no other fridge or freezer...

Air Temperature & Humidity (52 Hour Period)



Average temperature and humidity in both cabinets was similar, but the temperature span was considerably higher in the under-counter unit 6°C as opposed to the Adande® 3.5°C

Appliance	Adande®	Under-counter fridge
Average Temperature (°C)	-0.2	0.7
Maximum Temperature (°C)	2	4
Minimum Temperature (°C)	-1.5	-2
Temperature Span (°C)	3.5	6
Average Relative Humidity (%)	78	82

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Raw Fish Assessment by Chef Tuna



Adande[®]

Conventional



Slightly dehydrated



Extremely dehydrated, signs of
oxidisation

Let's look at how other examples fared in the
comparison test...

It's an Adande[®]; it works like no other fridge or freezer...

Raw Fish Assessment by Chef



Fish Type	Adande®	Conventional
Tuna	Slightly dehydrated	Extremely dehydrated, signs of oxidation
Cod	Bright glossy skin, white flesh	Dull discoloured skin, slight browning of flesh
Prawns	Bright glossy skin, white flesh	Dull discoloured skin, ★ slight browning of flesh
Haddock	Bright skin, white flesh	Dehydrated, yellowing ★ of skin and flesh
Salmon	Bright flesh, slightly dehydrated	Opaque Flesh, extremely dehydrated

★Assessment by Chef deemed 'unattractive and inedible'

It's an Adande®; it works like no other fridge or freezer...

Cooked Fish Assessment

Salmon and cod were cooked at the end of test with flavour and odour evaluated by Nick Coombs from Fish! Kitchen



Adande® Conventional

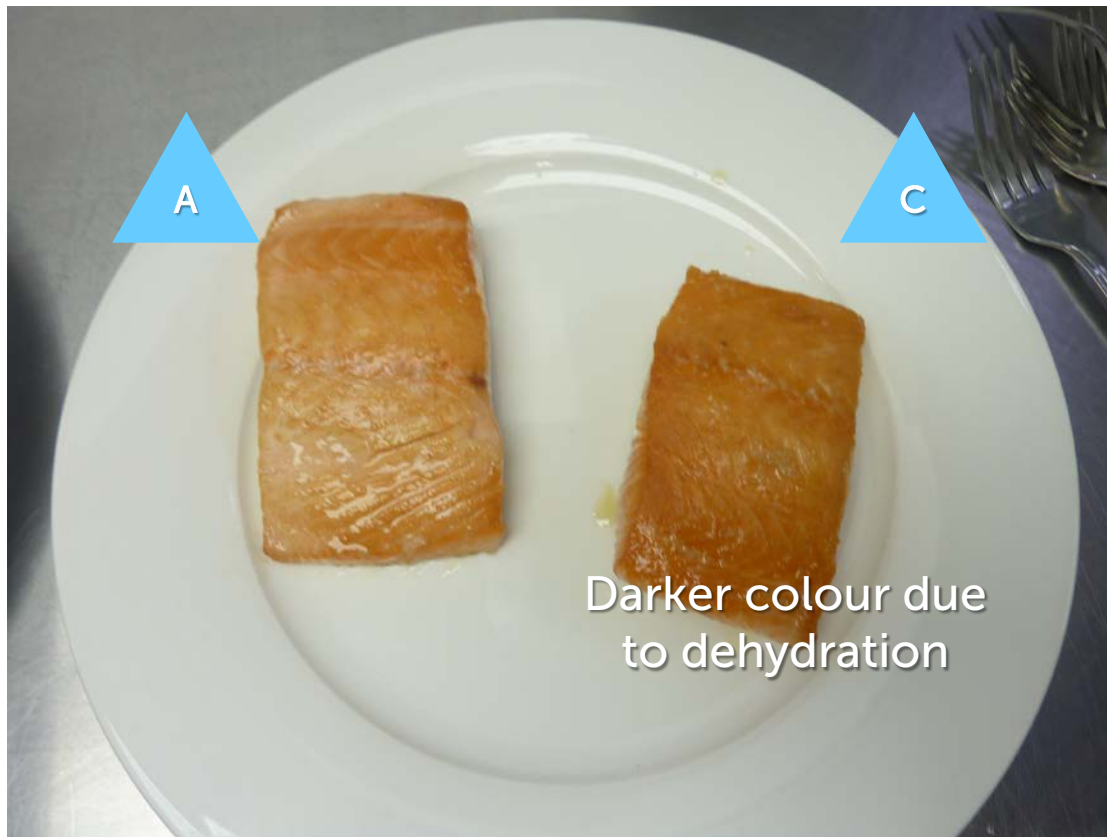
Salmon

Conventional

Dehydration clearly visible – surface darker
Tangy 'older' taste

Adande®

Maintained a meaty, sweet flavour



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Cooked Fish Assessment



Adande[®] Conventional



Cod

Cod (equal weight samples)
after 2.5 days storage:

Weight loss:

Conventional = 4%
Adande[®] = 1.5%

After cooking:

Adande[®] sample succulent

Conventional chiller sample
tough / fibrous

It's an Adande[®]; it works like no other fridge or freezer...

Product Weight Loss



Average weight loss in the conventional chiller was 3.5 times higher than that stored in the Adande®!

	Adande drawer®			Under-counter cabinet		
Fish species	Start of test weight (g)	End of test weight (g)	Weight loss (%)	Start of test weight (g)	End of test weight (g)	Weight loss (%)
Salmon	173	168	2.9	178	169	5.1
Tuna	149	147	1.3	160	151	5.6
Cod	203	200	1.5	202	194	4.0
Haddock	138	136	1.4	152	140	☆ 7.9
Prawns	154	153	0.6	154	145	☆ 5.8

Table 2: Fish weight at the beginning and end of the trial period

☆ Unattractive and inedible

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Summary – Conventional/Adande®



- Conventional chiller 5.7% average fish weight loss
- Adande® 1.6% average fish weight loss
- Cooked fish quality better using Adande® technology

Summary	Conventional	Adande®
¹ Start Value	£13.40	£12.90
² End Value (After 2.5 days)	£8.90	£12.70
Monetary Value Loss (%)	(-33.6%)	(-1.5%)

¹Start value cost of fish for trial

²End value of fish at end of trial excluding inedible products – see ★ on previous slide

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The Conclusions



Adande® significantly outperformed conventional refrigeration in side-by-side tests:

Visible difference in fish quality at the end of the storage period

Adande® maintains fish freshness for longer

Average fish weight loss in conventional chiller was 3.5 times higher than that stored in an Adande®

Refrigeration has a direct impact on final cooked product quality.

Adande® samples tasted fresher – conventional samples were dry, unappealing and in some cases inedible

30% less reduction in value and therefore less waste too with Adande® technology



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Acknowledgements



Westminster Kingsway College is a centre of excellence for professional cookery and hospitality training, accredited with the national training quality standard. The School of Hospitality has over 100 years of existence and is one of the leading education and training providers in the UK.



The Fish! Kitchens restaurants have built their reputation on serving the freshest fish. They were the first seafood restaurant in the world to work closely with the Marine Stewardship Council in sourcing fish.



Southbank Fresh Fish is a major supplier of fresh fish to the catering industry, specialising in premium-grade fish for the London market.

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