

The future of Industrial Refrigeration



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The year 2050 seen from the present

Main drivers influencing change

- Convenience
 - easy install
 - zero trouble
 - no maintenance
- New materials
 - plastics
 - nano-technology
 - oil-free
- Lack of skills
 - non-mechanical
 - plug & play
 - global solution
- Efficiency
 - by design
 - plc controlled
 - incentivised

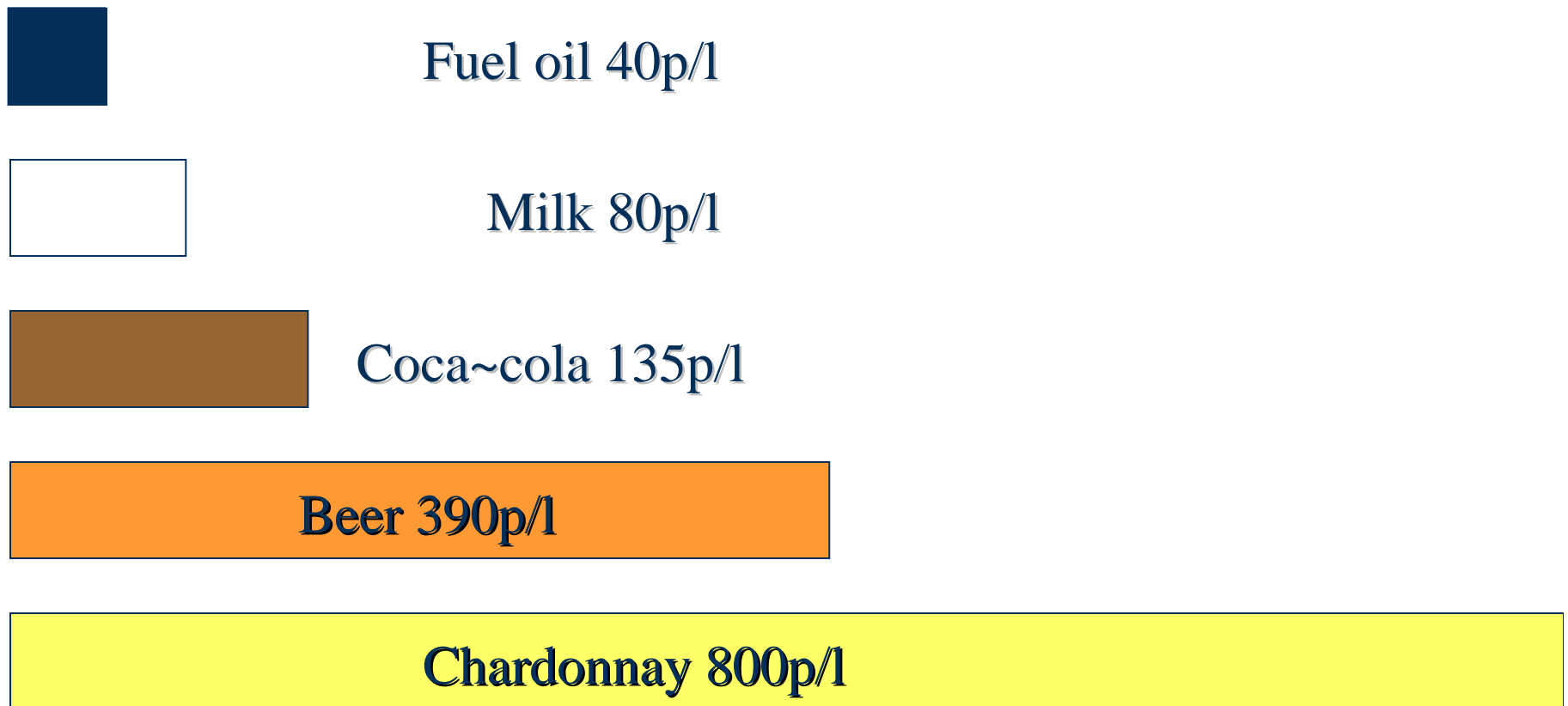


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The year 2050 seen from the present

Main drivers influencing change



The year 2050 seen from the present

Main drivers influencing change

Fuel oil 800p/l

Milk 80p/l

Coca~cola 135p/l

Beer 390p/l

Chardonnay 800p/l



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The year 2050 seen from the present

Main drivers influencing change



- China #1
- India #2
- Australia #3
- Russia #4
- America #5
- Japan #6
- Europe #7

The year 2050 seen from the present

Possible results of this change

- Widespread use of carbon dioxide
- Hydrocarbon as standard for a/c
 - in homes
 - in cars
 - in shops
- Ammonia phased out
- Reintroduction of R-12 and R-22
 - zero leakage
 - at a premium
 - for efficiency

(no mention of R-134a!)



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What about 2020?

- HCFCs phased out everywhere
- Continued use of ammonia in traditional applications
- HCs established in domestic and light commercial
- HFCs severely limited by high taxation
- Carbon dioxide common in industrial and big commercial plants, even in building air-con systems



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How will CO₂ be used?

- Volatile Secondary for chill
- Cascade with ammonia for LT
- and a combination of the above

- Cascade with low-charge R-134a
- or transcritical heat rejection
- or transcritical heat recovery



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Why will CO₂ be used?

- Lowest risk / least hassle solution
- Lower cost of ownership
- Combined heating and cooling
- Better system efficiency for secondary systems
- There may be no alternative.....



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Some final thoughts

- We will make the same mistakes
- again and again....
- Change is not always a slow process
- What happens to R-134a if the f-gas regulations are a failure?
- What happens to R-134a if the f-gas regulations are a success?



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Some final thoughts



“A hundred years after we are gone and forgotten, those who never heard of us will be living with the results of our actions.”

Oliver Wendell Holmes



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