



Air compressor system efficiency: A voluntary programme in New Zealand

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BACKGROUND

The Compressed Air Association of Australasia (CAAA) is an industry association representing manufacturers or distributors of air compressors.

The CAAA supports the compressed air industry by:

- Advocating the interests of its members before government and the public
- Promoting self-regulation to improve safety and quality
- Developing sound strategies for industry growth

INTRODUCTION

The CAAA was recently invited to speak at an international conference organized by the Australian Government¹: Motor Energy Performance Standards Australia 2009.

The presentation began with an introduction to industrial compressed air systems: their uses and typical efficiencies. This led to an overview of the Compressed Air System Best Practice Programme, implemented by the New Zealand Government's Electricity Commission. The programme's rationale, objectives, elements and results thus far were summarised.

The presentation concluded with information regarding further applications of the programme. This focused on its broad applicability, and important elements regarding implementation, such as ownership and funding.

This report summarises the presentation given.

¹ Department of Environment, Water, Heritage and the Arts

INDUSTRIAL COMPRESSED AIR SYSTEMS

ROLE OF COMPRESSED AIR

Compressed air is widely used in a range of commercial and industrial applications.

It is a self-contained power supply, and can operate machinery in sites where alternative power (such as electricity) may be unavailable or unsafe. An example is the use of air-powered drilling equipment in underground coal mines, where there is a risk of explosion.

Air is also used in the following applications.

Air type	Applications
Breathing air	<ul style="list-style-type: none">• Hospital air systems• Scuba diving• Respirators
Process air	<ul style="list-style-type: none">• Food and pharmaceutical processes• Electronics
Instrument air	<ul style="list-style-type: none">• Laboratories• Paint spraying• Powder Coating• Climate control
Plant air	<ul style="list-style-type: none">• Tools (eg pneumatic drills, high speed drills, etc)
Power	<ul style="list-style-type: none">• Mines, construction sites, etc

ELECTRICAL EFFICIENCY OF COMPRESSED AIR

Compressed air is a very high consumer of electricity. It is estimated that around 10% of all industrial electrical consumption in Australia is used to produce compressed air².

Because of its high electricity use, efficiency is crucial for cost and environmental outcomes. Efficiency improvements can range between low capital improvements, such as general regular maintenance and fixing leaks, to high capital improvements, such as installation of new air compressor units. Fixing leaks can improve efficiency by as much as 20-50%³.

Air compressors are not directly regulated for efficiency in Australia or New Zealand. They are currently on the E3 Committee's list of products under consideration, based on a recommendation in 2002 that they are more effectively self-regulated⁴. The Energy Rating website lists a range of

² Australian Government – Department of Resources, Energy and Tourism:
www.eex.gov.au/eexhomepage/smeenergymanagement

³ Compressed Air Association of Australasia:
<http://www.compressedair.net.au/documents/CAAA%20Brochure%20%20-%20Compressed%20Air%20Efficient%20Utilisation.pdf>

⁴ E3 Committee: <http://energyrating.gov.au/library/publications2002.html#report2002-06>



brochures developed by the CAAA's parent body, AMEI (Air and Mine Equipment Institute), and the Australian Greenhouse Office.

Minimum Energy Performance Standards apply to motors which power most large industrial air compressors. This increase in efficiency accounts for approximately 4% of a compressed air system's electricity usage.

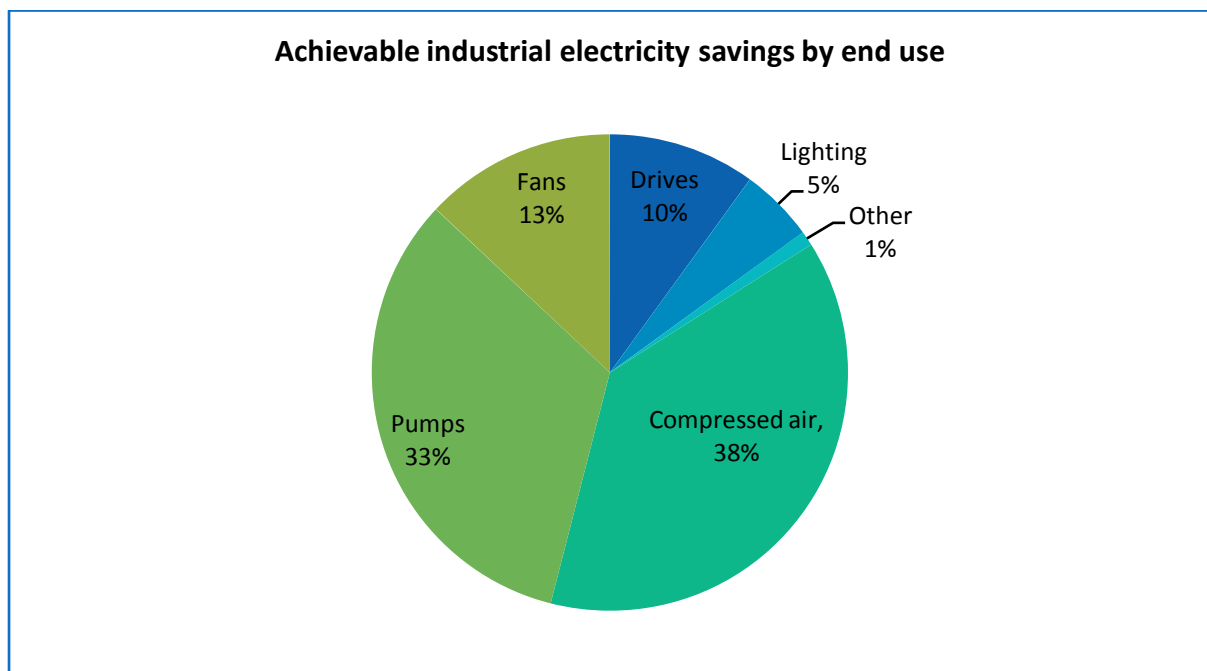
Several state governments in Australia have released information brochures providing information on compressed air efficiency, and many have adopted general energy efficiency programs. However, there is no specific program in Australia which targets compressed air system efficiency. Likewise, there was no such program in New Zealand, until the recent implementation of the Compressed Air Systems Best Practice Programme by the Electricity Commission.

COMPRESSED AIR SYSTEMS BEST PRACTICE PROGRAMME

RATIONALE

The Electricity Commission is a New Zealand Government organisation which "promotes and facilitates the efficient use of electricity"⁵.

Independent reports⁶ prepared for the Electricity Commission indicated that large industrial electricity savings were available, according to the proportions indicated in the following chart. Compressed air was estimated to offer 38% of the potential achievable savings.



Source: Electricity Efficiency Potentials Model, KEMA, accessed from <http://www.electricitycommission.govt.nz/opdev/elec-efficiency/approach/potentials/index.html>

⁵ Electricity Commission: <http://www.electricitycommission.govt.nz/>

⁶ Business Case and Project Plan: Compressed Air Systems Best Practice, 31 August 2007. (Internal document)



There were several impediments assessed which prevent these savings from being realised⁷.

- Poor efficiency is invisible to company decision makers, therefore savings are unknown
- Plant management focused on components rather than system
- No government/organisational focal point for information
- Shortage of suitably qualified auditing/optimisation practitioners
- Existing compressed air systems are oversized because efficiency is under-valued in initial design process

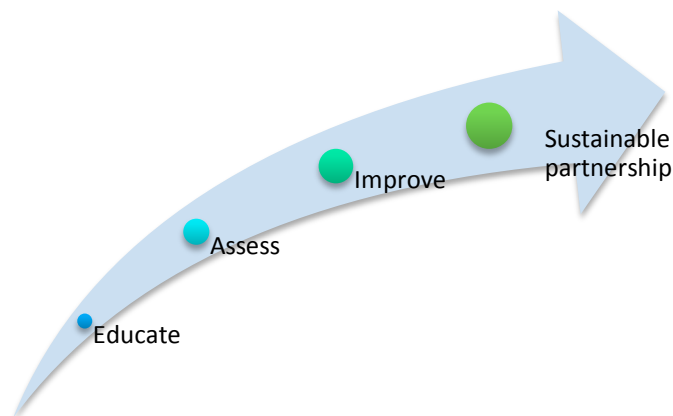
The Compressed Air Systems Best Practice Programme was designed to overcome these impediments to efficiency.

OBJECTIVES

The key objective of the programme is 185 GWh per annum electricity savings within 10 years. This quantity represents over 1% of New Zealand's total industrial electricity consumption.

The specific objectives identified to achieve the efficiency improvement were:

- Education of CAS advisors and auditors on design and operation
- Assessment of medium to large CAS operations, in return for user commitment to cost-effective efficiency improvements
- Funding of specific rework which would provide public value creation
- Development of self-funding partnership to sustain CAS best practice in New Zealand



⁷ Compressed Air Systems Best Practice Programme Business Case and Project Plan, Electricity Commission, August 2007



ELEMENTS

The elements of the programme were designed to address these objectives. The resulting actions follow.

- Develop a system of classifying “best practice” CAS, and a standardised reporting system for existing systems
- Develop and implement a training programme for auditors
- Develop and implement an accreditation programme to register auditors
- Make available fully funded CAS audits to large energy users

RESULTS THUS FAR

The programme has been successfully implemented by the Electricity Commission.

- New Zealand university (Waikato University) has implemented a training programme, and it has been run in 2008
- ~60 CAS assessments and audits have been completed
- Contracts have been signed covering 20 ‘in-depth audits’ (that are at various stages of completion)
- Annual electricity savings from the CAS programme at ~12.6 GWh pa (to end 2008)

Further development of the programme will continue, with:

- More extensive marketing of the programme (to cover plants down to 75 kW) commencing in early 2009
- Accreditation of auditors to commence in early 2009

OPPORTUNITIES

There is a large opportunity for other jurisdictions (such as Australia) to adopt the programme, because it is:

- Mature – all elements have been developed and implemented
- Widely applicable –
 - suitable for any jurisdiction without a specific compressed air efficiency programme
 - compatible with broader energy efficiency programmes, including energy auditing programmes
- Emissions reducing –
 - additional benefits for countries with mandatory emissions reductions targets
 - more cost-effective than alternatives



- Green job generating – skills required from:
 - Administration providers
 - Education organisations
 - Technical experts, such as manufacturers
 - Governments and government organisations

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