

# *Energy Conservation & Recycling*

- Policy & Practices in Relation to Controlled Environments
- Australia
- Lance Hoare, South Australian Research & Development Institute

Good Morning, Ladies and Gentlemen

My subject this morning is to present to you my view of the policies and practices which apply to the design and operation of controlled environments in Australia.

My short presentation will include :

My view of the past attitudes of Australian research organisations to the energy conservation and recycling issue.

A summary of the current economic and environmental pressures which are being felt by all energy users in Australia at the commencement of this millennium.

How a revised attitude to energy issues might impact on future controlled environment design in Australia, and

A few photos of my Institute's new research facility emphasising how energy issues were addressed and resolved in its design.

## *The Australian Challenge*

- A land of sun, sand and snow
- Ultra high solar loads
- Extreme cold
- Controlled environment design challenges

Australia is a land of sun, sand and snow.

Our landscape ranges from snow capped mountains through fertile coastal plains to the inland desert and our climate ranges from hot tropical conditions in the north through mild coastal weather to inland extremes of heat and cold.

This means that design of controlled environments presents a major challenge for user and designer alike and if energy efficiency becomes a major design criteria many technological options must be canvassed in the process.

The challenge to control greenhouses under such climatic conditions with minimum energy consumption must surely be the engineer's nightmare.

This challenge is becoming more serious in the new millennium.

## *In the Last Millennium*

- Emphasis on Scientific Function
- Fulfilment of User Demands
- The perceived need for flexibility
- Reasonable energy efficiency

My view is that in the last millennium most Australian research organisations and institutions adopted a generalised energy policy asking that all energy consuming equipment be “energy efficient”.

When applied to controlled environments this generally meant that energy efficiency took last priority behind

Scientific function

Fulfilment of user demands and

Use flexibility

And I believe that this approach proved effective in a situation where only reasonable energy efficiency was to be achieved.

## *Today's Pressures in Australia*

- **Shrinking research funding**
  - Results at lower cost
- **Greenhouse Gas Emissions**
  - Reduce usage/use green power
- **Privatisation of Electricity Generation**
  - Major cost increase in some States

In Australia today there are a number of economical and environmental pressures which are causing organisations using any form of energy to take a closer look at their rate of energy consumption.

These are

Funding bodies demanding research outcomes at less cost

The thrust by the Australian Government to meet its targets for reduction of greenhouse gas emissions and part of that is pressure to use green power at a higher cost to the consumer.

The privatisation in some states of Australia of electricity generation which has resulted in steep increases in the cost of electric energy, up to 90% in some cases

As controlled environments are large energy eaters organisations using these facilities will target new and existing CE's as areas where energy consumption can be curtailed and costs saved.

## *In Practice*

- Australian Experience in New Projects
  - Design with features matched to outcomes
  - Ability to introduce options later as needed
  - Filter user demands
  - Get independent specialist advice
  - Evaluate ready made units v custom built

There will always be a market for “off the shelf” controlled environments particularly when the requirement is for one or two units. The Australian experience is that off the shelf units or those of standard manufacturer’s designs are always much more expensive than those which are custom built.

Maybe this is because the manufacturer designs for all options when the user might not want them. Maybe it is because we are paying for a manufacturer’s view of what the controlled environment should be rather than a user’s view. Maybe it is because the “standard” product needs a lot of change to meet the user’s needs.

Whatever the reason it is a fact and one which the manufacturer might address in the future. There is no doubt that a purpose designed controlled environment will meet user needs more accurately, has the capability of incorporating only necessary options and can be planned to include energy conservation and recycling features more easily.

For large scale controlled environment projects there appears to be an economy of scale in going down the custom built path.

## *What We Did*

- Plant Research Centre
  - Energy Efficient Design - Today & Tomorrow
  - Were wary of Traditional Design Processes
  - Had someone independent manage it
  - Got a competent CE specialist on board
  - Prepared detailed engineering briefs

The Plant Research Centre was designed in 1991/2. It was intended to serve South Australia's Agricultural Research needs well into the new millennium. We knew we had to get it right - we would not be given a second chance.

So we planned for an energy efficient design for the day and for the future of the whole complex and took that attitude into the design of our controlled environments.

We decided to be wary of the traditional processes whereby responsibility for the whole process from user requirements through to final documentation and construction is usually given to the Architect and his design team.

We employed a manager who was independent of users and architects. We employed a competent controlled environment specialist to determine performance specifications and to ensure those specifications were followed in the design and construction process.

The end product has been hailed a an unqualified success.

## *Our Energy Package*

- Co-generation
- Hot Water Storage & Re-cycling
- Ice Making and Recycling Melted Ice
- Economy Cycles - Max Use of Outside Air
- Efficient Use of Thermal Insulation
- Variable Speed Fans
- Computer Based Controls - Economisers

Co-generation - natural gas fired reciprocating engine

Hot Water - capture of engine coolant hot water & recycle as heat source

Ice - Make and store ice & recycle melted ice as cooling source

Economy Cycles - using naturally conditioned air if close to set point

Thermal Insulation - twin walled polycarbonate is a successful greenhouse cladding and imparts some thermal insulation

Variable Speed Fans - ensures fan energy consumption matches the load required

Computer Based Controls - facilitates accurate control of chillers and fans so eliminating waste energy

## *In the New Millennium*

- A culture needs to be developed to make energy conservation part of our planning by
  - Emphasis on Scientific Function
  - Equal emphasis on Energy Conservation
- To achieve this there might be
  - A Filtering of High Energy Cost User Needs
  - Demand on suppliers for Low Operating Costs
  - Recognition of environmental impacts

So in the new millenium the emphases on issues affecting controlled environment design might change.

Scientific function must always remain the most important design feature - the facility must produce the scientific outcomes expected.

But we might see some filtering of user demands to ensure that unused options which eat up energy are left as future variations and to match outcomes with features. The Australian experience is that this will save energy and money.

There might also be a closer weighing up of providing multiple uses at day one in the name of flexibility. If projects last for years there might be a case for building in only those features necessary for that project providing others can be easily introduced later.

There will most certainly be a greater emphasis on energy conservation and recycling in regard to controlled environments in the interests of saving money and saving environmental damage.



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