Aquafarmer Australia

Kel Gordon

On

RAS

Above is, or was one of the largest

RAS AQUAFARMS

in Australia.

The Cummincorp C-Box, RAS Farm Design

I was working as a labourer on the Gold Coast. And a job came up to manage a new type of fish farming system.

So, I was employed to complete the initial designs, address start up issues, produce an operations manual and manage the immediate scale up to one hundred and fifty such tanks

and train up the twenty staff to run the farm 24/7. I then went on to manage the entire aquaculture park for nearly two years.

Each individual C-Box RAS was capable of producing six tonne of barramundi per year. That is a nine hundred tonne production per year, in the outer suburbs of the Gold Coast. Indeed a C-Box Farm could be set up and run in George St Sydney or the back blocks of Alice Springs. Actually, a pilot system was set up in Los Vegas.

The C-Box RAS was a brilliant design and with another year of fine-tuning it would have had global success. It got rushed and that was its failure.

The entire structure consisted of 27 individual panels and tanks, held together with huge stainless rods. Each individual panel was rotomoulded using a unique double moulding technique. The blue outer layer is structural plastic but there is an internal white plastic that acts as a complete insulation layer.

Each individual box was a complete RAS unit capable of a final density of 180kg/m^2. An horrendous amount of fish to be certain but never the less a world record. The secret was simply how the CO^2 was removed. Sheer brilliance.

However it was a proto-type and should never have gone into commercial production with design flaws let alone submit a prospectus and go public.

The cost of energy consumption was way too high, the design was not up to commercial standard with daily teething issues with drum filters and the biological filters were charcoal and very substandard. And that led to some very strange issues. However, more due to necessity, we developed ways to kick-start a new tank and biofilter so that it could be stocked within two to three days of filling.

The C-Box was like drive a V8 Supercar, requiring round the clock attention to maintenance, feeding and water quality testing. And eventually I crashed.

I had had a heart attack working 120 hours per week but eventually got back to work. The cause was probably over work and over exposure to ozone in my lab. The farm used heaps of ozone.

Each Box had a complete internal filtration system and each bank of seven boxes were connected to an external bio-filtration system and water polisher system using ozone. But no one knew how to operate the conglomerate of technology and control the water chemistry.

I instigated the development of remote monitoring of all water quality parameters running graphic displays in my office 24/7. One wall had a large TV screen with a digital outline of the entire farm, all 150 boxes giving instantaneous results of all necessary water quality parameters.

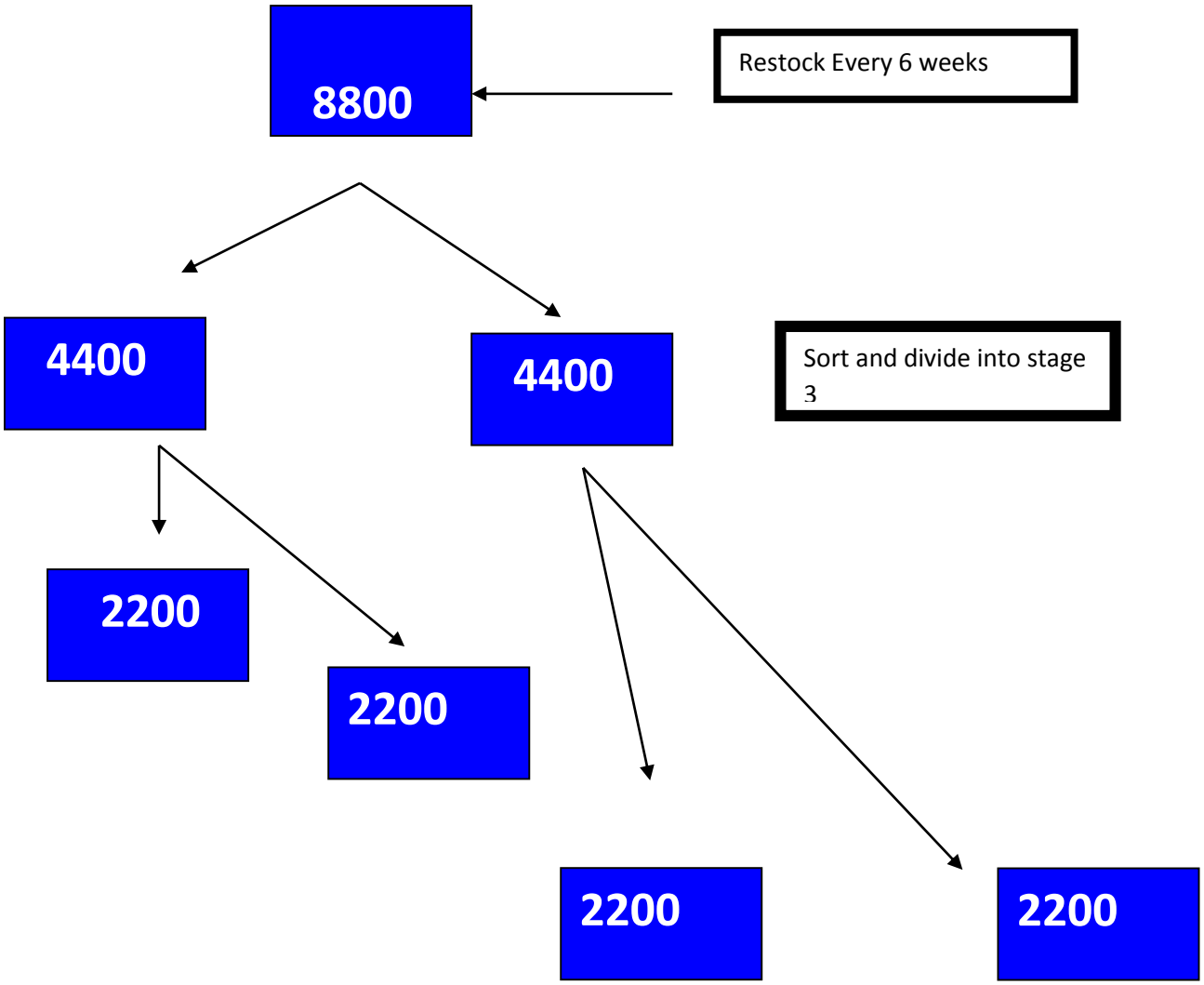
Together with my nephew we built the first remote aquafarming remote control system in Australia. I could see when a stress event was going to occur before it happened. Remote sensing was an absolute game changer for such high intensity RAS Aquafarming.

My boses claimed we had stolen the design. So I quit on the spot. No two weeks' pay, no due entitlements. The farm went into liquidation about six months later.

Figure 1 Rebuilding a defunct unit bought at auction

Figure 2 A most brilliant failure. A 150 C-Box Aquafarm

1. The C-Box: Seven Box Model



This initial culture model did not work. It is far more efficient to reduce the density of Barra from day 1.

Their growth rate increases dramatically with reduced numbers.

The seven box culture model has several basic flaws that demonstrate prototype development rather than commercial viability.

a…….The initial high density dramatically reduces growth rates.

b…….The theoretical restocking every six weeks requires dedicated batch culture back-up facilities including a hatchery and nursery to avoid bottlenecking.

c …….there is no data that supports the models claims

d…….The Aquaculture Park went directly to commercial production with several major design faults. These created instability leading to excessive dumping to waste to maintain water quality. On some nights up to 260,000 litres were dumped to waste.

e…….Within a few weeks of start up, the failure of the secondary systems became evident.

f…….The design faults compounded culture issues and productivity declined proportionally to escalating water quality issues visible as increasing disease events.

g…….Disease issues quickly went from isolated outbreaks to endemic culture factors

Extract from a Confidential Report Regarding Issues of Concern

(K Gordon 4-2006)

Current C-Box issues include:

1…the issue of excessive water consumption and disposal while maintaining commercial feeding rates.

2…low production efficiency.

3…dangerous and ineffective feeding ratios and rations.

4…disease issues.

5…batch culture continuity.

6…hatchery production & cost solutions.

7…successful marketing of C-Box product.

8…excessive cost of production including power consumption

9…inexperience in fish sorting and grading procedures

C-Box RAS Production Potential Summary (K J Gordon 2006)

The author is confident that the C-Box can be made to work as a profitable commercial fish culture system.

The C-Box still requires defined qualification requiring at least another 18 months of R&D on a commercially orientated pilot scale. The system is not ready to go commercial.

Some of the components need refinement while others need scraping. There is a need for considerable engineering of components.

The author is also confident that if the C-Box concept is demonstrated as commercially viable C-boxes will simply sell themselves. (Worldwide)

Interestingly, if the gross return price on C-Box product is above $15/kg then even the existing CCL Aquaculture Park, even with the current water quality issues etc, still approaches commercial viability.

The author's C-Box research on growth and performance (with Barramundi) indicated that; by utilising a nursery application 4 crops per year, per box, would be possible with an initial stocking size of 100gram and limiting the numbers to the critical density.
Commercially, such a move would make the C-Box extremely viable even at $8/kg. Other species of fish do appear to require similar recognisable culture steps to confirm growth and FCR.

Within the next few years very high value saltwater species such as coral tout and barramundi cod will come on line and the C-Box system is suited to both fresh and saltwater applications.

Further research on C-Box flow, relative to species and species schooling behaviour, indicated simple modifications to the main tank could viably sustain many commercial species, potentially including prawn and abalone culture.
However such a bold commercial viability insight is still another research step entirely and not for publication.

None of the above issues were address as the company went public. And so I left the company wearing all the scape goat stains of greed as people lost their homes and some even went to goal.

Land Based Oyster Culture / Mollusc Biology & Culture. (1985 – 1988)

During university studies in Tasmania we devoted considerable effort to the culture of oysters. We set up experiments and showed that oysters could be ‘fattened’ artificially on simple off- the-shelf diets, which was highly significant for hatchery production at that time.

As well, we set up an off-shore, submersed experimental oyster farm as a project which was eventually destroyed by a large shark.

My personal projects also included design and constructing a high density recirculating systems for holding oysters, abalone and lobsters.

So, it was not unusual to set out to build the first RAS, land based oyster farm. Behind these tanks, in the picture below, are a series of ponds for continuous culturing of algae. It was a brilliant setup with oyster growth reach a staggering one millimetre per day. The initial design called for 6 such tanks holding approximately 2 million spat.

Kel looks to future of oyster farming

A Forster electrician is excited about his development of land-based oyster farming which he claims will revolutionize the industry in the Great Lakes.

Wallis Lake Oyster Farmers Association is not so sure and president Mr Maurie Verdlich has voiced doubts about the procedure's viability.

Although Mr Kel Gordon admits his process is still in its infancy, he sees it as the future of oyster farming in the Great Lakes.

He says his technique of oyster growing, (table welling), is unique.

It involves growing oysters on a flat surface and pumping water through that surface. Mr Gordon says a higher density of oysters is achieved using this method.

He proposes to take oysters to the spat stage of development (about the size of a 20 cent piece) and then sell them to leases, which will see them through to maturity.

MR Kel Gordon is dwarfed by the two huge tanks he uses to farm oysters in Forster.

The process is called table-welling and is part of a land-based oyster farming technique.

"You're working with a more controlled environment and so you have a greater degree of control over the oysters' development," he said.

Mr Verditch is not so sure.

"When you start trying to improve on nature you often find it'll turn around and give you a swift kick in the face," he said.

He says the cost of running Mr Gordon's scheme makes his product uneconomical to buy and leasees will face "overcatch" problems when the partially matured oysters enter the Lakes.

In this company structure the partners decided that two tanks were sufficient. After our initial spat catch the two tanks held approximately 1.5 million spat. To my surprise, the spat were still growing rapidly even at this extreme level of concentration. Although, I had to shake each multi-level tray every day to stop the oysters from growing together.

How and why this venture failed can be found at:

http//aquafarmer.com.au/Land Based Oyster Farming.html

The Land Based Oyster Farm failure is a story like so many failed aquafarming ventures in Australia. People controlling the funds just don't listen and think money can overcome any aquafarming obstacle.

From that company I learnt to never have an accountant partner. They cannot see past day 35 on a production schedule sheet. Aquafarming does not work to a paper model. It simple doesn't work that way. The hundreds of failed RAS ventures in Australia make this statement more clearly than I ever could.

People seem to see stars and fall in love with the scary fest of technology and the over indulgence of electricity and unnecessary support facilities. Very little concern is ever given to the cost of maintenance and replacement costs. I believe that was how the C-Box RAS raised its funding.

Actually there is a book, or two, in documenting such failures just in NSW. But at the end of the day it is simply my opinion of aquafarming failure.

To name just a few opinionated reasons of RAS failure they would be:

1….. Faith in overpriced technology. Sales people are absolute consultants right up until the payment is made.

2….. Not understanding water chemistry. I worked for one day in an RAS where the water was so bad I could not get the smell out of my skin. Also 30% mortality was considered acceptable. They did not last long and yet extracted millions out of passionate supporters.

3….. People fail to see that, profits are made in construction and design. Not in product sales. Beware of consultants that are not successful themselves. In fact do not undertake aquafarming in Australia. The rules and woke stupidity will crush even the best intensions.

4….. The real shock is; Sustainable RAS is at the other end of the technology spectrum. The number 48 is the golden key to sustainable farming. And no, if you can't work it out you should not do RAS.

5….. And as said above, the need for extensive maintenance and repairs in only a few years has to be avoided. A real farm should operate for at least 20 years before shut-down style maintenance is required. All my farms have achieved this in all the basic goals.

Kel Gordon's Aquafarmer Australia,

POD RAS Aquafarming Systems

Back in 1986 the first POD RAS design was developed. The result was a hugely successful fish farm based on natural filtration and biological control.

The system was simple. The system was extremely efficient and it was unique. And to this day it leads the way in future design application.

---Summary---

Natural Filtration. Biological, Mechanical and Nutrient Removal.

Only one pump for water flow, filtration and aeration.

Final Density of 33kg per cubic meter. Or 33 fish per 1000 litres of culture tank.

No unknown variables in design or operation.

Continual Flow rate equals 15% of total volume

Filtration size by volume equals the flow rate multiplied by 48. One third biofilter, one third mechanical filter and one third nutrient stripping.

During my fish farming and consultancy days I published several articles on fish farm construction and cost-effective methods of crop production.

As with any of my aquaculture designs, which indeed cover fish, molluscs, rotifers, algae culture and crustaceans, I have always commenced with a pilot system addressing commercial scale stage applications, to prove the concept before financial commitment.

The RAS system below is just such an example of careful research (1988) The poilot sacle setup can still be seen at the bottom of the picture.

Here is a simple RAS design for an intensive, designed not far from Taree. This RAS design, I call it the POD RAS (prodigious organic diffusion) produced 60 tonne of fish over an 18 month period and used only one 3.5 kw transfer pump to move water to a header dam and then gravity recirculate water back through the culture ponds.

A design of efficiency and longevity.

Example: 1….. The Biofilter- Agitated once every six months.

2….. Nutrient stripping via duckweed and water hyacinth. Cleaning needed once per year.

3….. Automatic Feeding and water circulation

This passive RAS farm required 2 people to run year round and several others during pond harvest days. I called it armchair aquafarming.

Basically this farm was a crossover in that it utilized the benefits of mechanical and biological filtration while still utilizing the benefits of pond culture as well.

It still has a capacity of 10 tonne to the megalitre and apart from the pump there are no moving parts.

At the time (1988) silver were fetching $24.50 per kg live into Sydney Fish Markets.

Figure 3A Passive RAS Aquafarm. Two 50-60 tonne modules.

This RAS farm was expanded to a dual 60 tonne system. Only 1 pump per bank was used to run the complete cycle for each bank.

The POD RAS was a highly efficient system design for 1987. This farm was considered to the most advanced silver perch farm in the Eastern States.

(Bill, Kinta Fish Feeds)

The pilot scale development took 2 years. The farm took 6 months to build. I was terminated the day it was fully stocked, as per my contract.

The one big mistake here was the lack of trained staff to understand the nature of water chemistry.

An RAS Aquafarm can never be underestimated.

n 

Figure 4 I built this entire farm from scratch

Above is Hallidays Point Fish Farm and Hatchery. It was just bushland when I started. Twelve months later it was a profitable fish farm and multi species hatchery. So much so I began getting work all around the world. I believe it was the first ever private water catchment and private water disposal farm in Australia. Actually the ponds are still there and still holding water 30 years later. It is not RAS but it survived on the same principles.

Figure 5 The same farm from a more glorious view

The POD RAS:
Applied to Coral Trout and Whiting Aquafarming

In 2010 I began work on Coral Trout while breeding and running the hatchery on a 40Ha crab farm in Queensland.

I started playing around and breeding CT using a new type of hormone injection system and several, size variation species of rotifer, from the local mangroves, grown exclusively on nanochloropsis.

The larval survival results were surprisingly high compared to published information but CT, at any life stage, do not take to commercial diets and algae cultures as these feeds are nutritionally deficient.

So I began researching a live feed source. And found it in feeding all stages of the local species called Whiting and went on to develop a commercial application for hatchery production with great success. Ponds were stocked with about 1 million Whiting per 4 Hectares.

The hatchery could run all year round and supply feed from day old larvae to six inch fingerlings. When feed live feeds, CT and Barra has an enormous increase in growth rates.

This is the future of fish farming, as I see it. High quality nutrition, excellent growth rates and very little, if any, disease issues, while all occurring under a semi-automatic POD RAS.

http//Aquafarmer.com.au/Whiting.html

Whiting, A Prawn Farming Alternative.

Here was a chance at a unique breakthrough in aquafarming. No processed, inferior diet and no need to over stock.

'Whiting can be bred in all months of the year and when used as a complete diet for CT culture the growth rate of CT is about that of low density Barramundi culture.

For this reason Whiting are the best species for aquafarming. All humans eat them and they are the missing link in successful nutrition. And they are very fecund at about half a million eggs.'

I went as far as to design a 2000 tonne CT POD RAS production farm but found such leaps in applied application are not always met with applause. The beauty of it all was that most interest was in attempting to stealing the design. Indeed a company used my hatchery protocol to breed whiting.

They failed. Sometime later the boss rang to ask how I went with the breeding. I said, 'about 18'.

He said,' Yeah we only got about 15, six inch fingerlings. It was a failure also.'

I said, 'Actually I meant 18 million.'

Here is the overall thing about RAS for profitable aquafarming. The approach to water chemistry and filtration in RAS has to be passive and it has to be capable of low maintenance for at least several years. These results are proven outcomes

Predigious Organic Diffusion in Recirculating Aquaculture Systems allows nature to carry the load, as it were. Why over step such profitable efficiency?

Well, like most uni graduates my head was full technology and 'this is the way' RAS. Had I not worked in China I would probably not have even considered a passive alternative. I guess it come home when it was obvious the pellet feeds in Australia were nutritionally inefficient to the point of unprofitable.

Coral Trout Farming Potential

The Pod Recirculating Aquafarming System (2009)

Aquafarmer & associates have designed a unique fish farming system. Most of our work is still cutting edge so we cannot mention specifics unless you are covered by a 'Deed of Confidentiality".

However, our fish farming tests have concluded with (final density) stocking rates at 180 kilograms per cubic meter. That is the best fish farming result ever published, we think. (final density for holding and not for culture)

Fish farming growth and mortality have proven to be excellent due to our very low stress factors in culture and live feed techniques.

Our fish farming system has incorporated the most sophisticated vertical integration in the most simplistic manor. This factor has enabled a potential profit return approaching 37% within the second year of operation. (probably closer to 50% but not proven)

We have based our fish farming design on 50 tonne production modules. At $10 per kg that is $50,000 with two staff and auto control with Aquasense Remote Monitoring. At $60/kg the same amount of effort returns $300,000 per crop per tank with 2 crops per year.

Coral Trout = $60/kg

Barramundi Cod = $45/kg

Barramundi = $12/kg

Production Costs = $7.50/kg

Why Farm Barramundi?

A great idea but …. Ther it is.

Thank you for reading my historic account of life in aquafarming 1985-2014