The Evolution of Aquaponics in Alberta, Canada

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Lethbridge College

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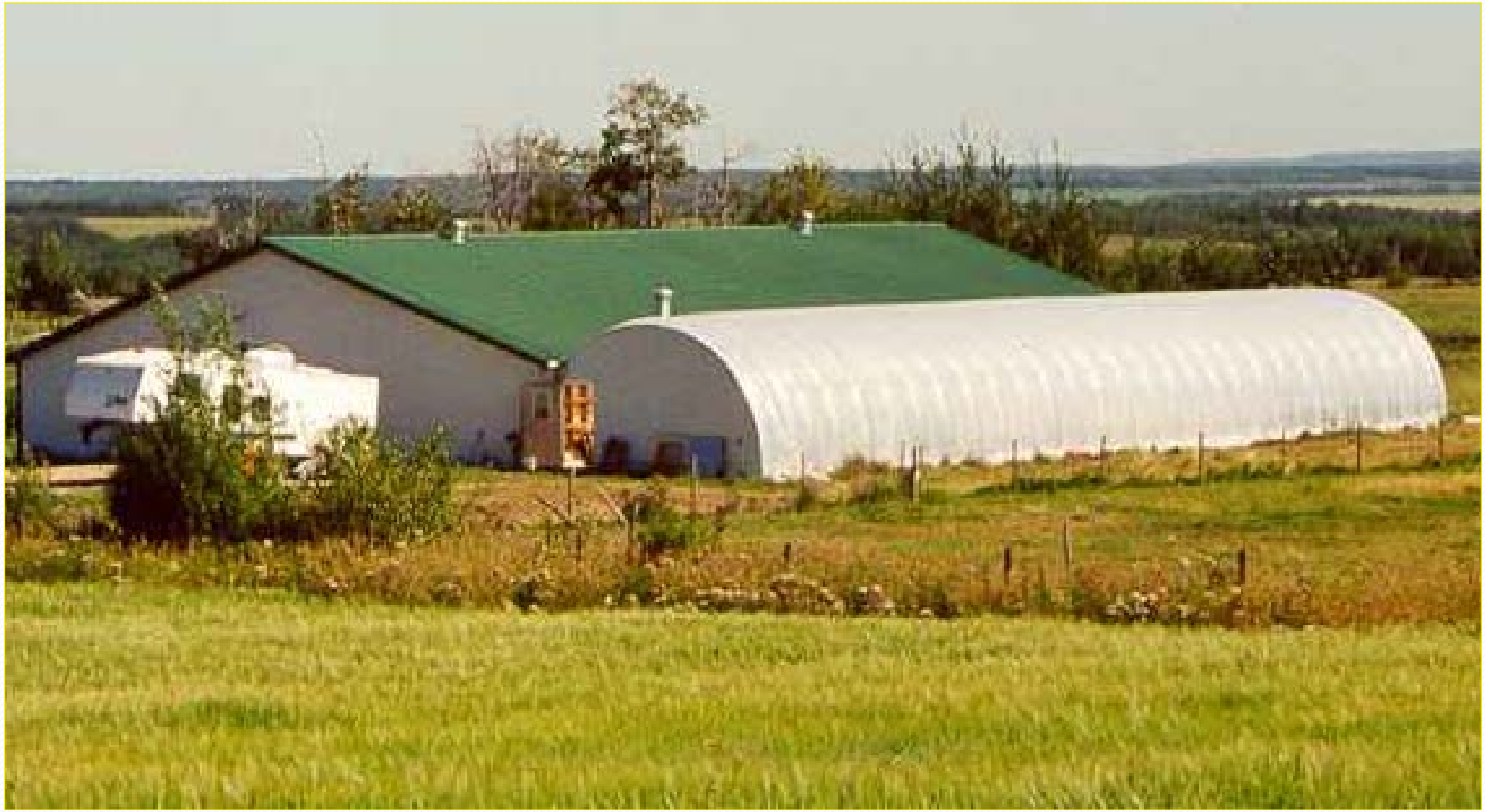
In the Beginning….

- Aquaponics research in Alberta was strongly driven by the industry
- A number of fish growers in Alberta built greenhouses and started growing vegetables since mid-90s
- Alberta Agriculture started aquaponics research in 1994

Circle M Trout Farm, St. Paul, AB, 1995

Doug Millar



Greenview Aqua Farms, Calgary, AB, 1997

Darwin Monita, Victoria Page

MDM Aqua Farms Ltd, Rumsey, AB, 2000

Mark and Curt McNaughtons

First experiments with aquaponics in Alberta started at CDC North by Thean Pheh, Alberta Agriculture technician, in 1994-1996. He successfully grew Koi and rainbow trout as well as variety of crops in a small system including:

- Tomatoes
- Watercress
- Lettuce
- Bok Choy

Aeroponic and gravel bed designs were used at CDC North

Aquaponics research in Southern Alberta

- Aquaponics research in South Alberta was initiated by Eric Hutchings, provincial aquaculture specialist, after he took aquaponics course at University of Virgin Islands
- The research started from building greenhouse at Aquaculture Centre of Excellence, Lethbridge College

Aquaculture Centre of Excellence
Lethbridge College

Ron Beck

and

Alberta Agriculture and Rural Development

Eric Hutchings

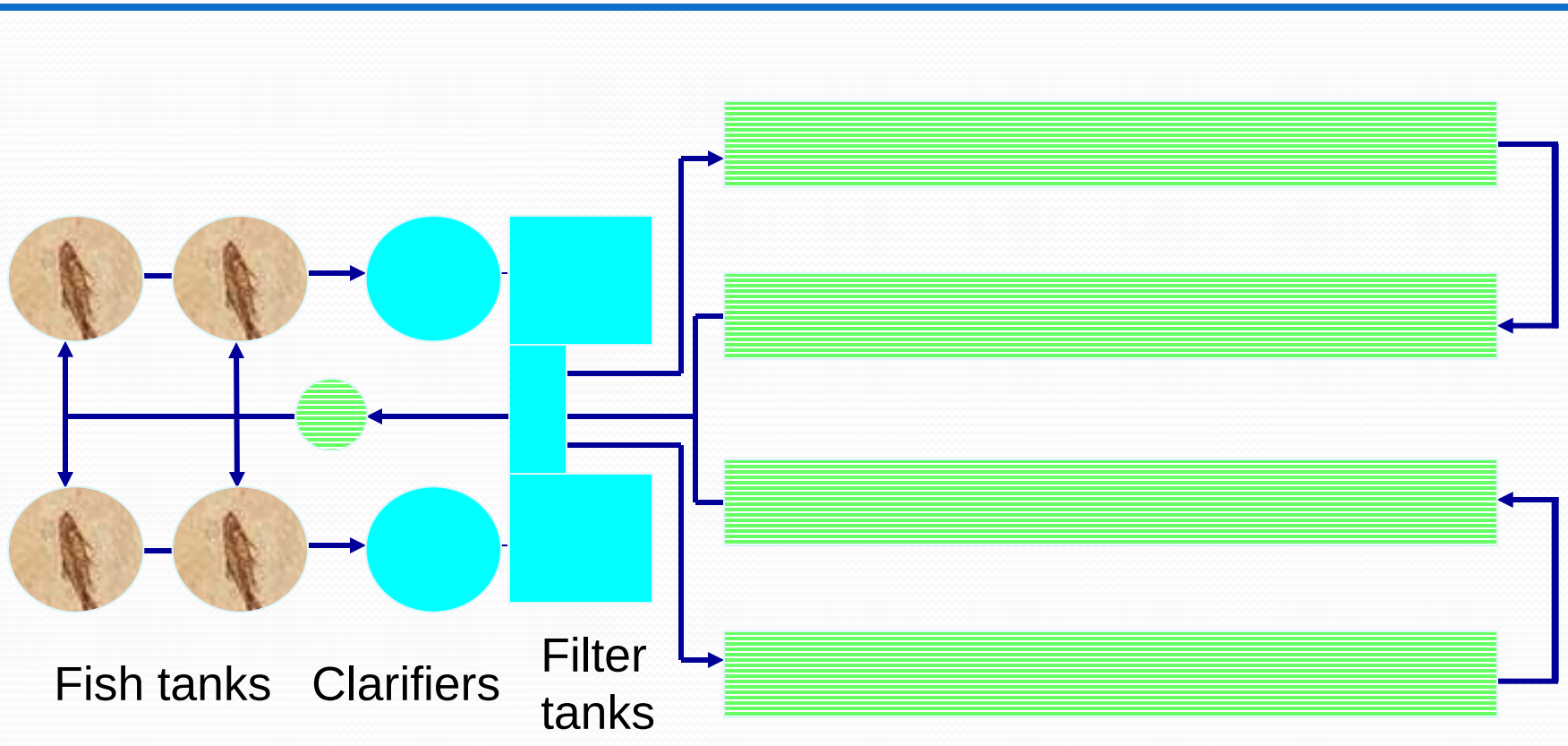
Svat Jonas

Bill Hirsche

Aquaculture Centre of Excellence
Lethbridge, 2003

2002 CDC South, Brooks, AB

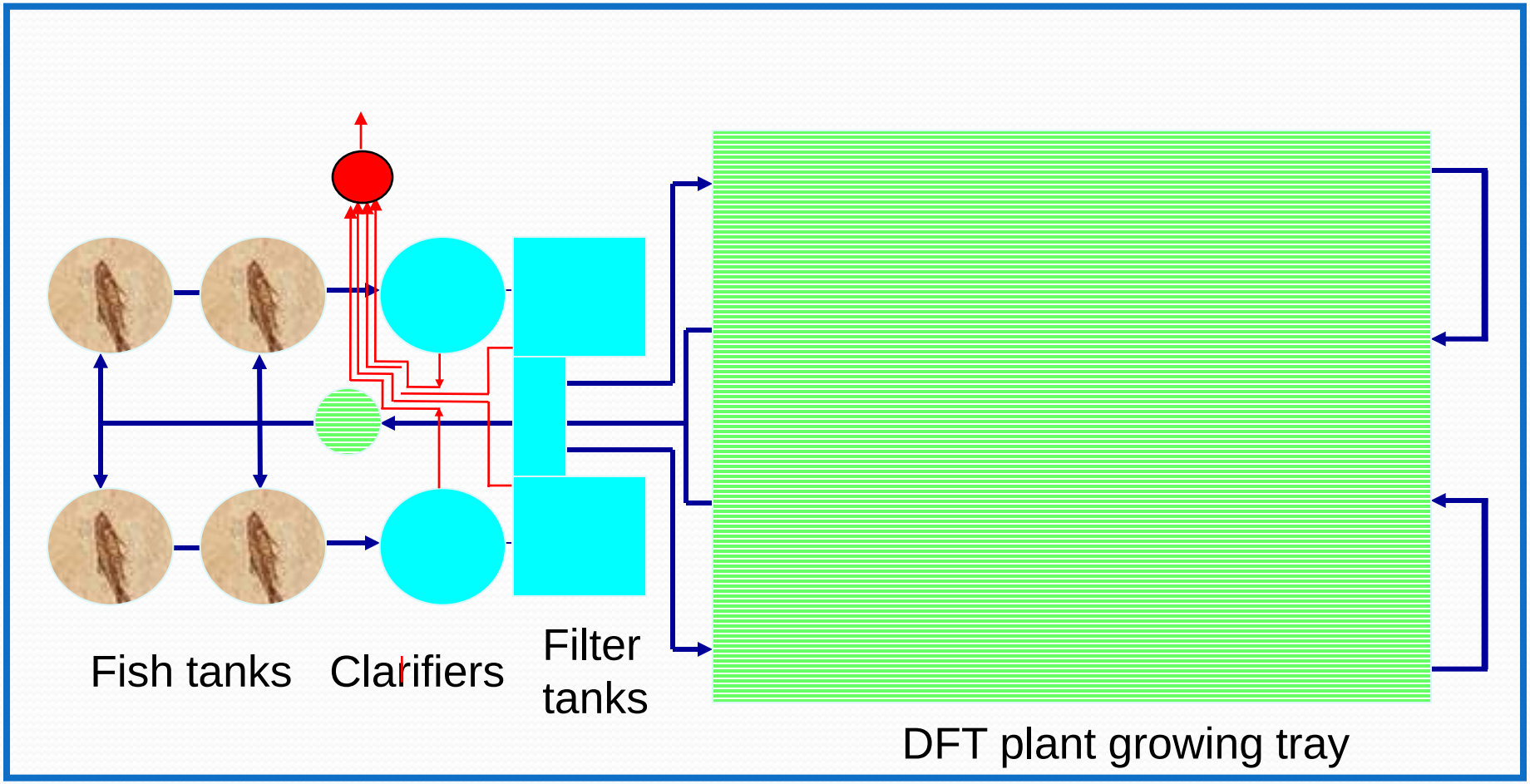
Brooks Aquaponics Facility was based on the model developed at the University of Virgin Islands



Dr. James Rakocy, summer of 2002

Four different models/generations of commercial aquaponics prototypes were designed and tested in Brooks Research Center, Alberta

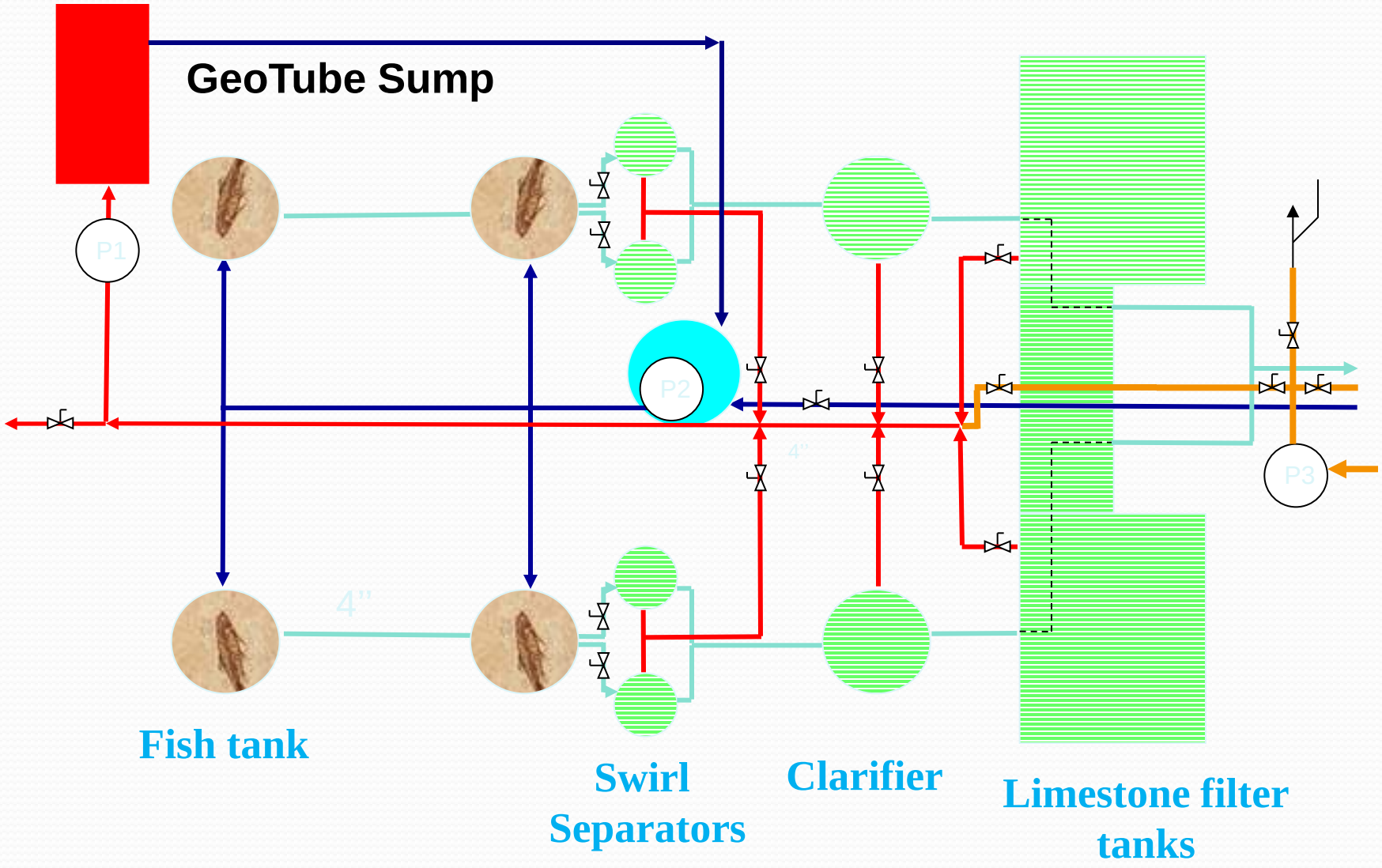
2nd Generation Aquaponics Facility



Parameters of the pilot-scale system in Brooks, Alberta

- Total volume – 73 m^3
- Plant area – 84 m^2
- Flow rate – 700 L min^{-1}
- Fish production capacity – 3.7 tons $year^{-1}$
- Basil crop production – 3.5 tons $year^{-1}$

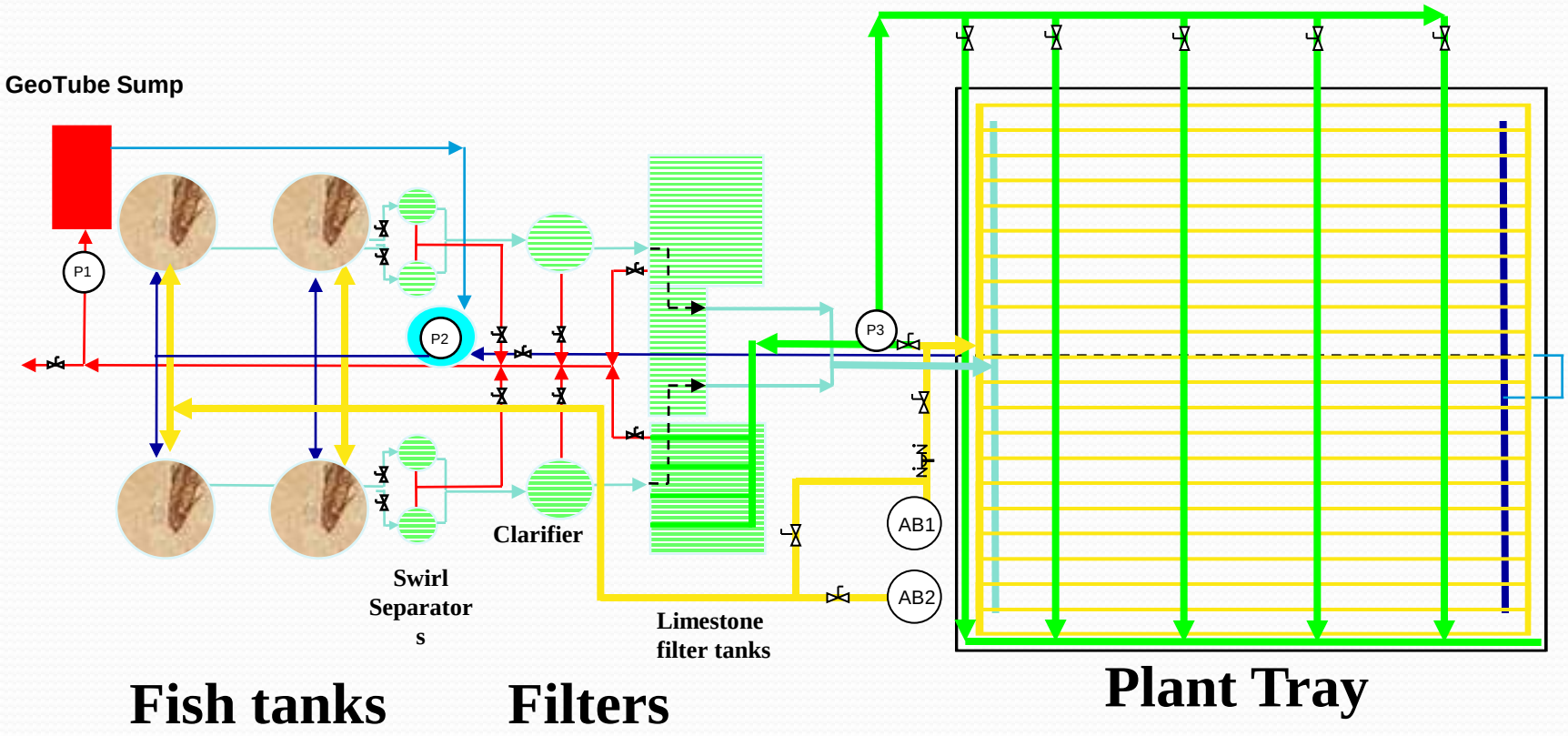
3rd Generation Aquaponics Facility



The two-loop-design system in Canada has three main parts:

- Fish Rearing
- Plant Production
- Waste Treatment

Generation 3 aquaponics facility



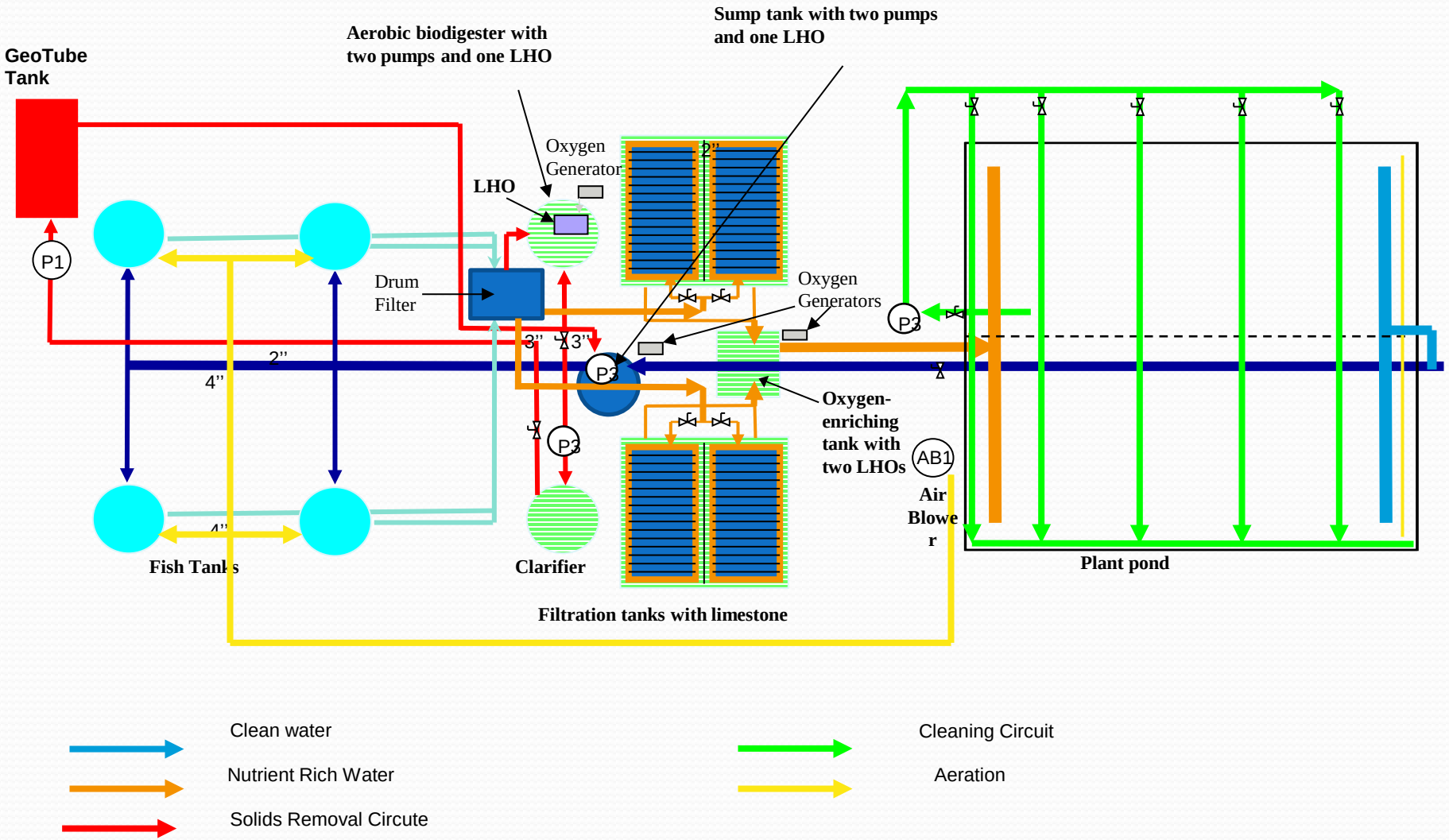
Sludge accumulation in the plant tray results in:

- Anaerobic decay of organic material
- Accumulation of ammonium and other toxic compounds
- Fast growth of opportunistic pathogens, such as *Pythium*
- Plant stress and yield loss due to diseases

Pythium Root Rot

Improper waste management results in the system failure in 95% of all cases

Generation 4 Aquaponics System

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Oxygenation in 4th Generation aquaponics


ANLG
LHO
HYBRID

Hospital Oxygen Concentrator - 95% pure oxygen


Handy Polaris
352 %
SAT
28.4 mg/L
21.0 °C
Esc
OK
www.oxyguard.dk
OxyGuard®

Advantages of oxygenation over aeration

- Higher dissolved oxygen level, up to 22 ppm, higher fish stocking density
- Higher positive redox potential - faster mineralization rate
- No water splashing – better food safety
- Less power consumed
- Less water evaporation rate – 0.1% per day
- Better management

Features of Generation 4 Aquaponics System

- Stable pH at 6.0-6.4
- Zero waste
- Zero water discharge
- 100% nutrient use efficiency
- No fertilizer supplements
- Minimum labor
- Highest water use efficiency achieved

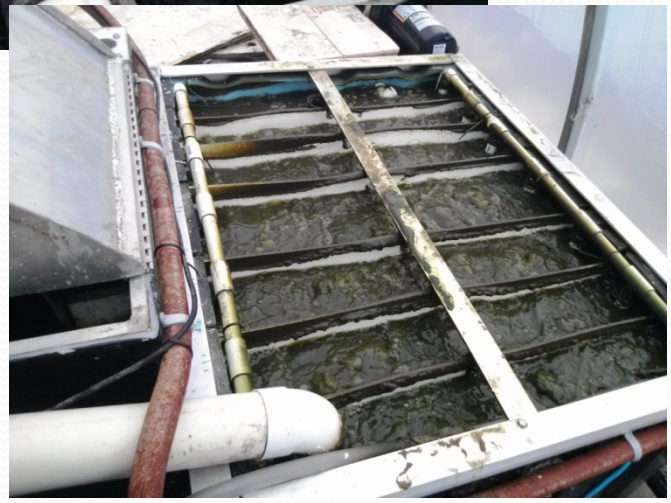
Commercialization of new generation aquaponics in Canada

Commercial aquaponics system at Red Hat Co-operative, Redcliff, Alberta


Fish tanks, 8’ diameter, 4’ deep
Plant bed, 215 sq. m, 1 foot deep (average)

Aquaponic cucumbers

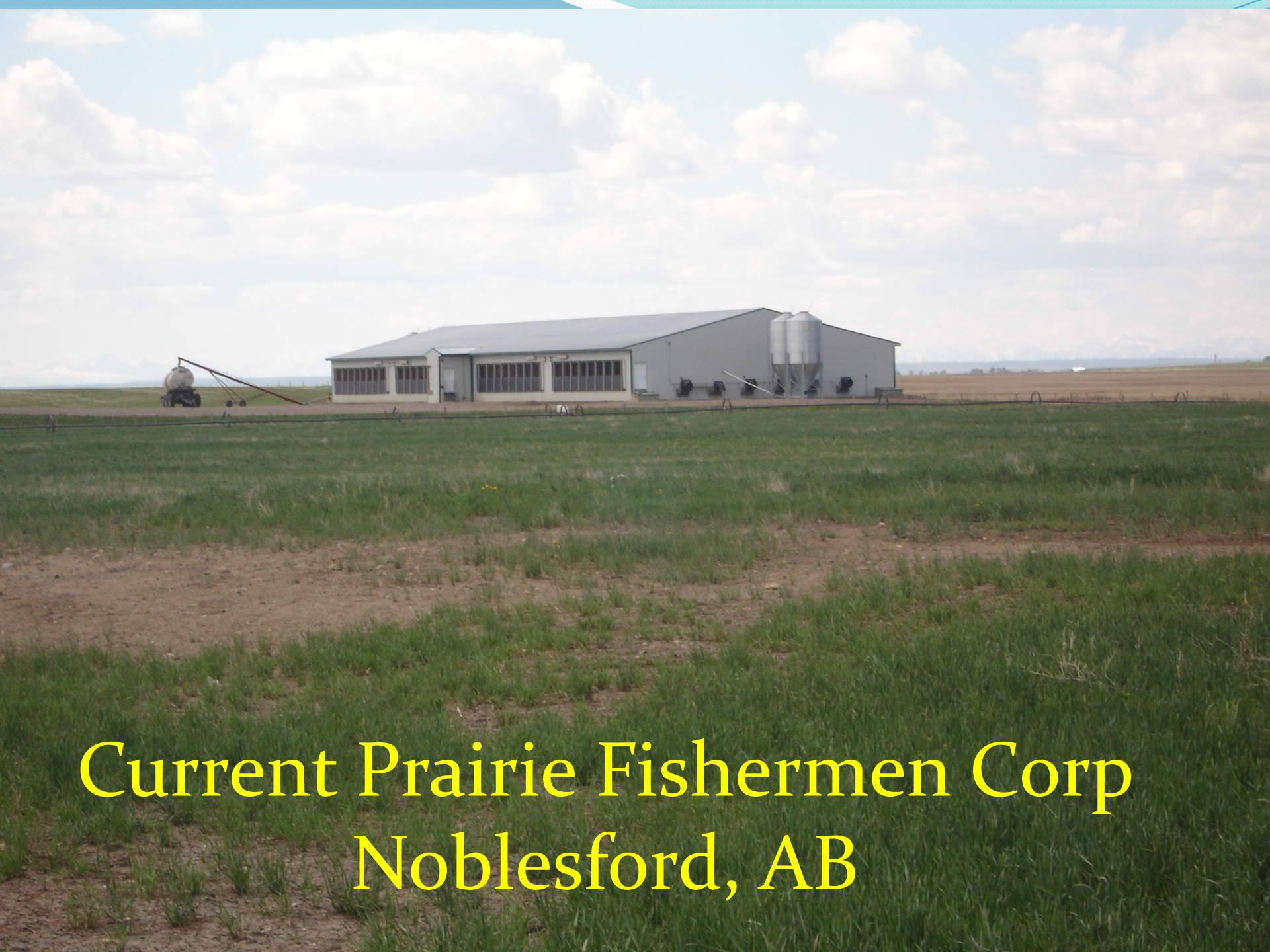
MDM Aquafarms, Alberta



Northern Bioponics, British Columbia


HYDROTECH

There are several Canadian companies commercializing the technology with total investment over $3.0 M in Alberta alone


Current Prairie Fishermen Corp
Noblesford, AB