How to take an idea from a laboratory to market – Contract R&D organizations.

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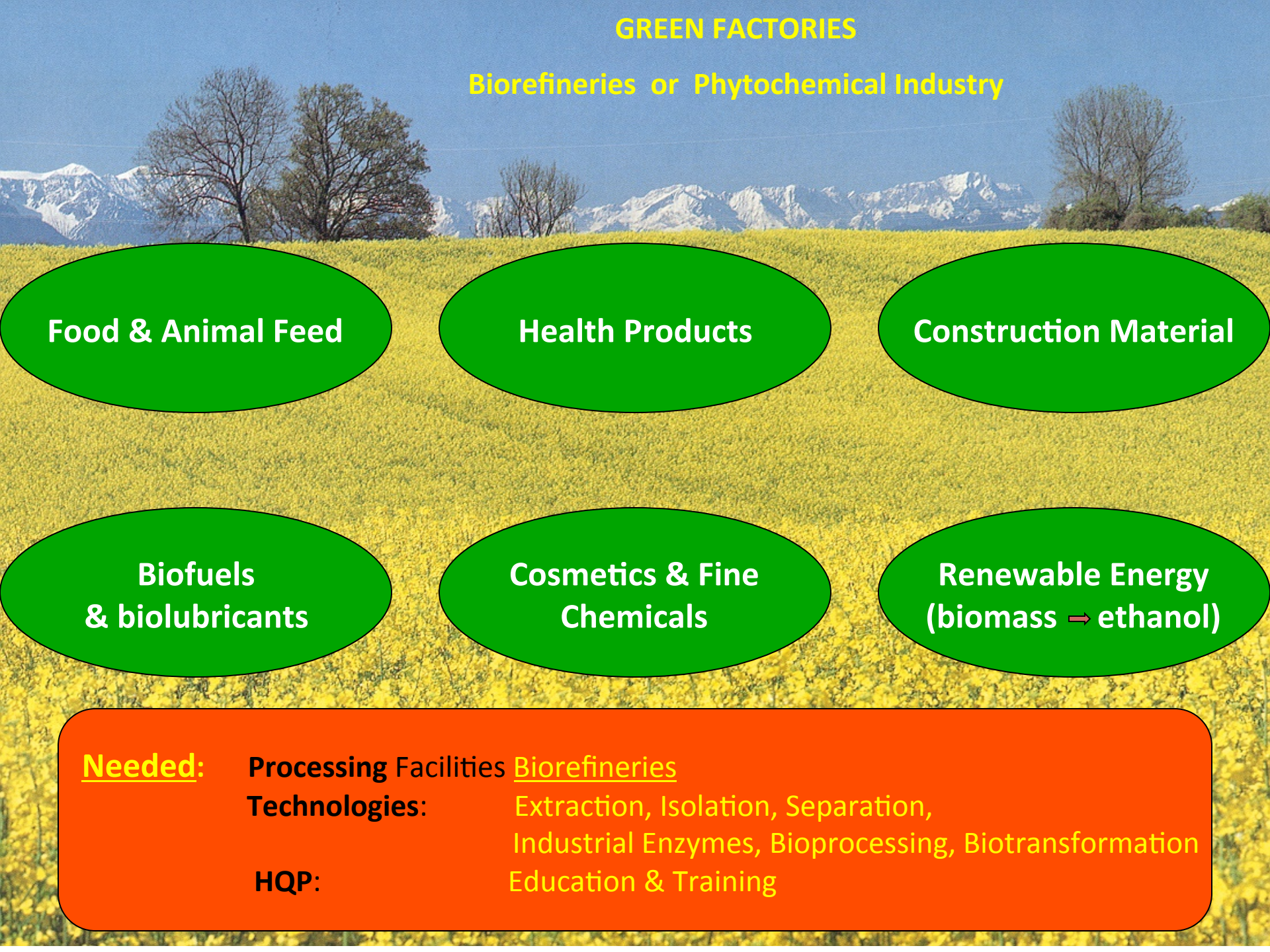

GREEN FACTORIES
Biorefineries or Phytochemical Industry
Food & Animal Feed
Health Products
Construction Material
Biofuels & biolubricants
Cosmetics & Fine Chemicals
Renewable Energy (biomass ➞ ethanol)
Needed: Processing Facilities Biorefineries
Technologies: Extraction, Isolation, Separation, Industrial Enzymes, Bioprocessing, Biotransformation
HQP: Education & Training

BASIC RULES

Until something gets manufactured, society cannot benefit

There is no wealth creation until something is sold

Steps in Tech Transfer

INVENTOR (S)

- Intellectual Property, Prove of Concept
- Provide the License
- Sooner or later, the business people need to take over. - *Understand that from the beginning.*

START-UP Co.

- Develop the manufacturing procedures
- Make sure they understand what theirs customers will do with the “products“
- Leverage private money with government and corporate development grants / contracts
- Use Contract R&D to develop the manufacturing procedures, QC and QA
- Prepare market testing production batches

PRODUCTION

- Transition from a “founder-led” start-up into dependable supplier of products to a defined set of customers

SCIENTISTS

- Earn their reputation as individuals
- Getting recognized for giving away knowledge
- Tell people how to reproduce their work
- Customers don't matter
- Economic feasibility doesn't matter

ENTREPRENEURS

- Know that teamwork provides leverage
- Protect knowledge to gain every advantage
- Fear other people reproducing their work
- Customers matter
- Economic feasibility is paramount

SCIENTISTS

- Publications are their currency
- Succeed more by publishing than patenting
- Overvalue their contribution
- Think the technology is everything

ENTREPRENEURS

- Profits are their currency
- Publishing has to be justified in strategic terms
- Let scientists think they are valuable
- Know that technology is just the “card in the game”

Technology Transfer

- In most countries, academia has rights (and obligation) to patent results of Intellectual Property (IP) derived from taxpayers funded research
- Major universities have Tech Transfer Offices which manage the technology transfer to commercial partners
- Such a IP could be available to companies interested in its utilization

LICENSE GOVERNANCE

Academia/Research Institutions may play different roles in technology transfer:

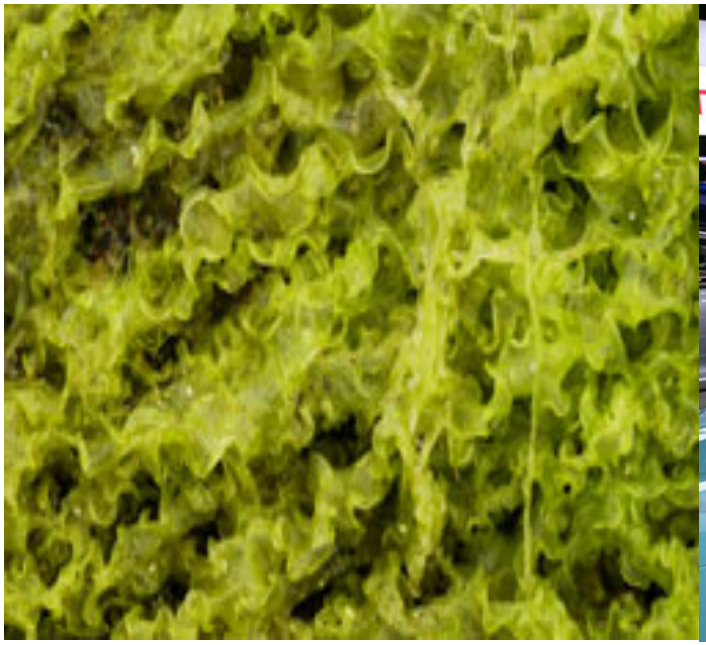
- Licensor
- Shareholder
- Partner

LICENSE TERMS

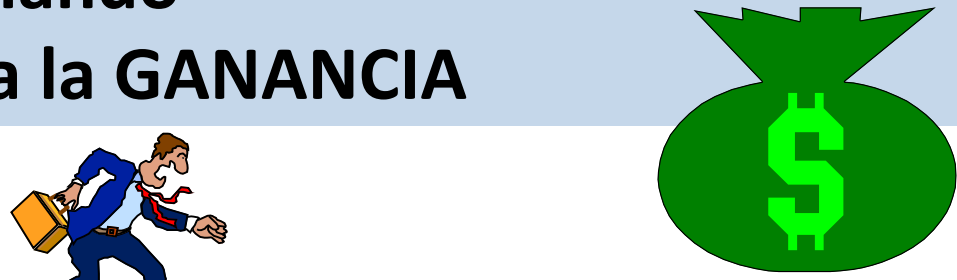
- Exclusive or not
- Upfront cash payment or equity
- Patent cost reimbursemen
- Ongoing royalties
- Diligence milestones
- Sponsored research

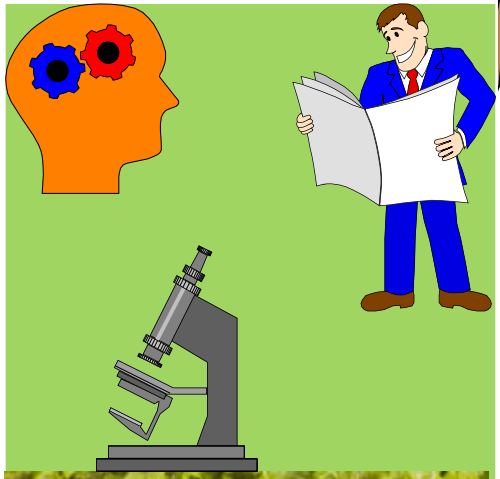
Toyota is looking to a greener future — literally — with dreams of an ultralight, superefficient plug-in hybrid with a bioplastic body made of seaweed that could be in showrooms soon

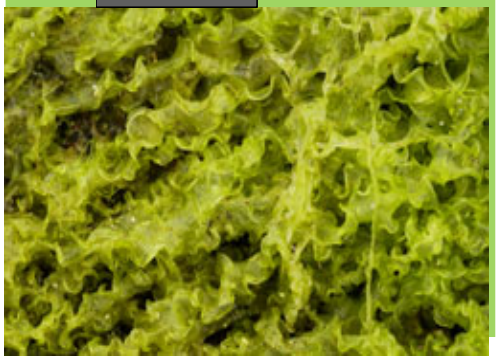
Melbourne Herald Sun Feb 24



Caminando
desde la IDEA a la GANANCIA





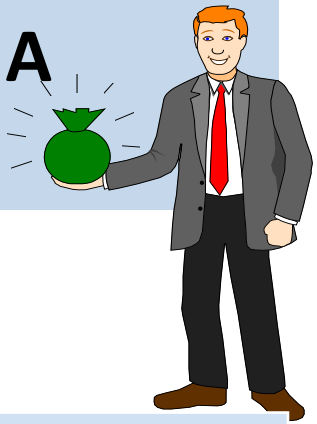


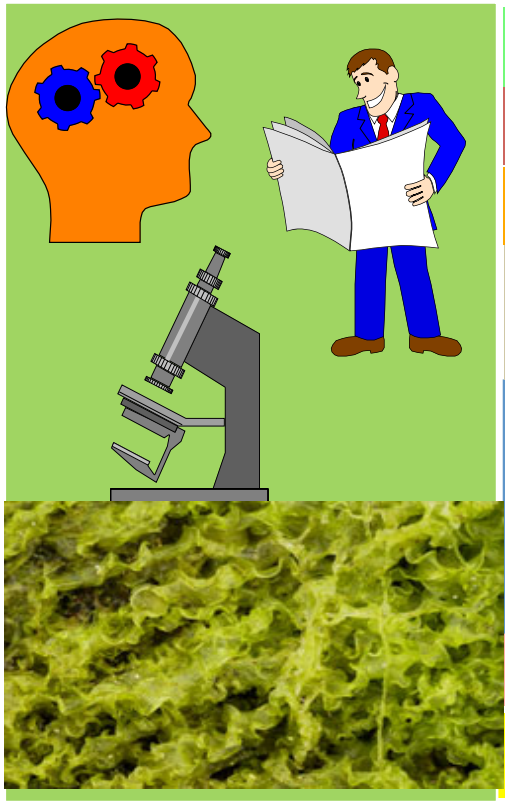
PRECIPICIO

(valle de la muerte)

Caminando desde la IDEA a la GANANCIA

- cruzando el precipicio -





Mercado

Regulaciones

Capacidad productiva

Aseguramiento de calidad

Contrato de Servicios Investigationes y desarollo (Planta Piloto)

Procesamiento

Cultivo/Cosecha

Scaling-up

Role for Start-up Companies

- Depending on the license agreement the inventor/scientist might be (or not), member of the start-up company. The license is usually granted for fixed time.
- Company would find suitable partners (i.e. CR&D organization) and resources necessary to accomplish the scale-up, technology development, Q.C. and Q.A. procedures, along with market diligence.
- Non-disclosure agreements are obligatory for all partners.

Project Example

- University – Alberta Innovates Technology Futures (*formerly* Alberta Research Council)
- Utilization of Jerusalem artichoke plant for:
  - Inulin (food, nutraceuticals)
  - Biomass for ethanol production
  - Lactic acid – polymers PLA
  - Biochar

Objective

To evaluate the agronomic performance of Jerusalem artichoke (*Helianthus tuberosus* L.) as a novel carbohydrate platform crop suitable for a development of agricultural biorefinery in Alberta

Jerusalem artichoke as a Carbohydrate Platform Crop

- **Livestock feed**
- **Biochar** (C seq)

- **Biopolymers**
- **Fuel Alcohols**

Functional food
Inulin

Phytoremediation

Selected agronomic varieties can produce over 100 tonnes of biomass per hectare per year, yielding around 30 tonnes of tubers and 70 tonnes in foliage and stalk

Prerequisites for successful biorefining

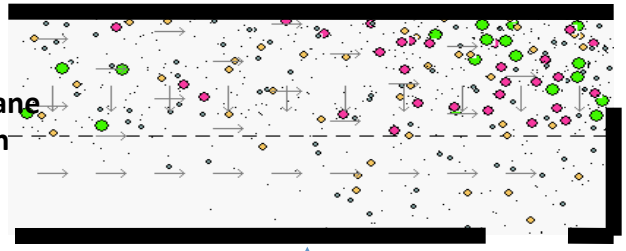
- Feedstock cost – critical for economics of biorefinery
- Dedicated fast-growing biomass crops
- Low input crops (nutrient use efficient)
- Stress resistant (i.e. water use efficient)
- Grow well on marginal land – no competition with food crops
- Whole crop utilization – zero waste concept

Biology of Jerusalem artichoke

- Native to North America from the Composite family
- Forms tubers
- Deep root system
- Annual/Perennial

Conclusions: Jart biorefinery model

Membrane filtration



Washing & size reduction

Hot water Extraction

Molecules Separation & Liquid Condensation

Small molecules

Pre-handling, size reduction

Lactic acid Fermentation

Residual Biomass

Monomer Production

Polymer Production

PLA, Modification

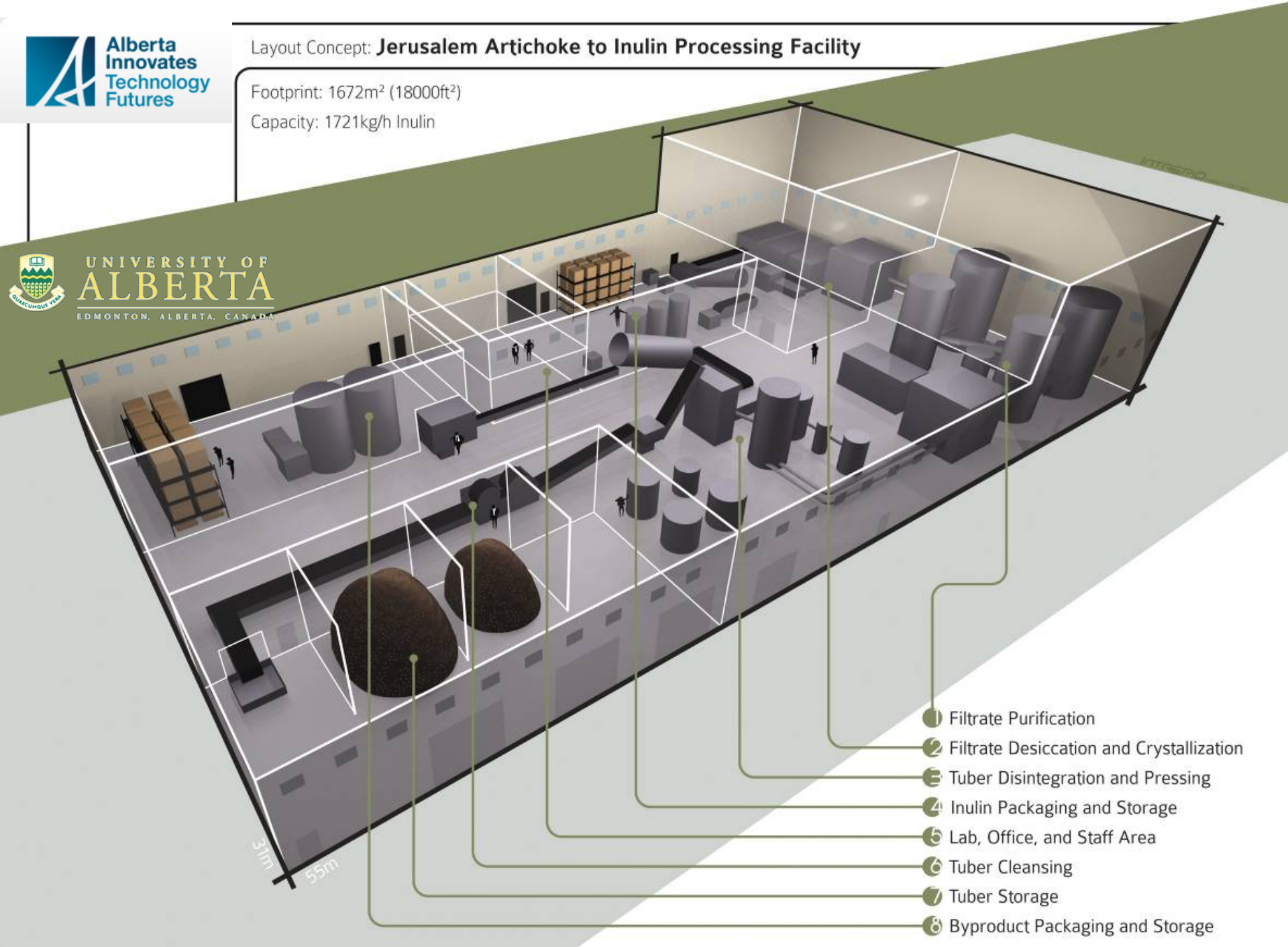
Alberta Innovates Technology Futures

UNIVERSITY OF ALBERTA
EDMONTON, ALBERTA, CANADA

Layout Concept: **Jerusalem Artichoke to Inulin Processing Facility**

Footprint: 1672m² (18000ft²)

Capacity: 1721kg/h Inulin



Contract R&D
POS BioSciences

- Processing of biological material
- Specializing in processing of oils, protein and starches
- Providing confidential research services.
- Total operating area: 5 400 sq. m.
- Staff: 85 includes scientists, engineers, plant operators, laboratory technicians, marketing experts.
- In operation: 35 years
- Located in Innovation Place, on University of Saskatchewan campus, Saskatoon, Canada

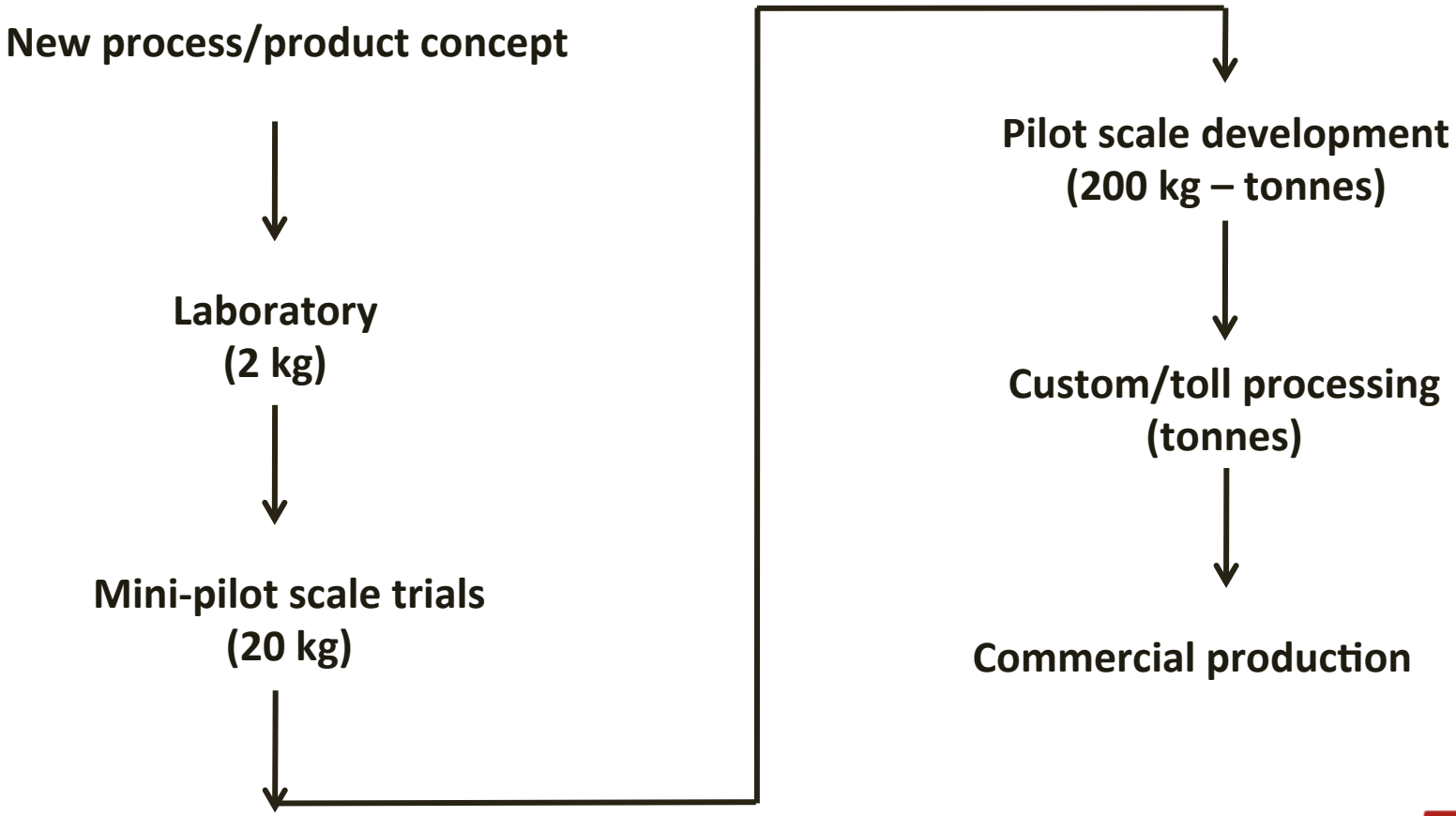
POS
BIO-SCIENCES

POS Bio-Sciences, Saskatoon, Canada

1: POS Bio-Sciences 2: Innovation Place 3: University of Saskatchewan
4: City of Saskatoon 5: Canadian Light Source (Synchrotron)

POS
BIO-SCIENCES

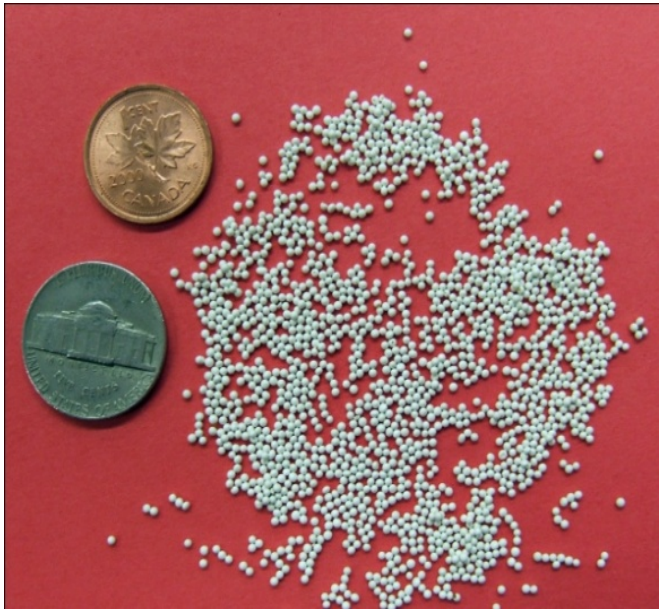
Concept to Commercialization



POS BIO-SCIENCES

Bead Milling – Extraction of Algal Biomass

Bead Mill (POS)



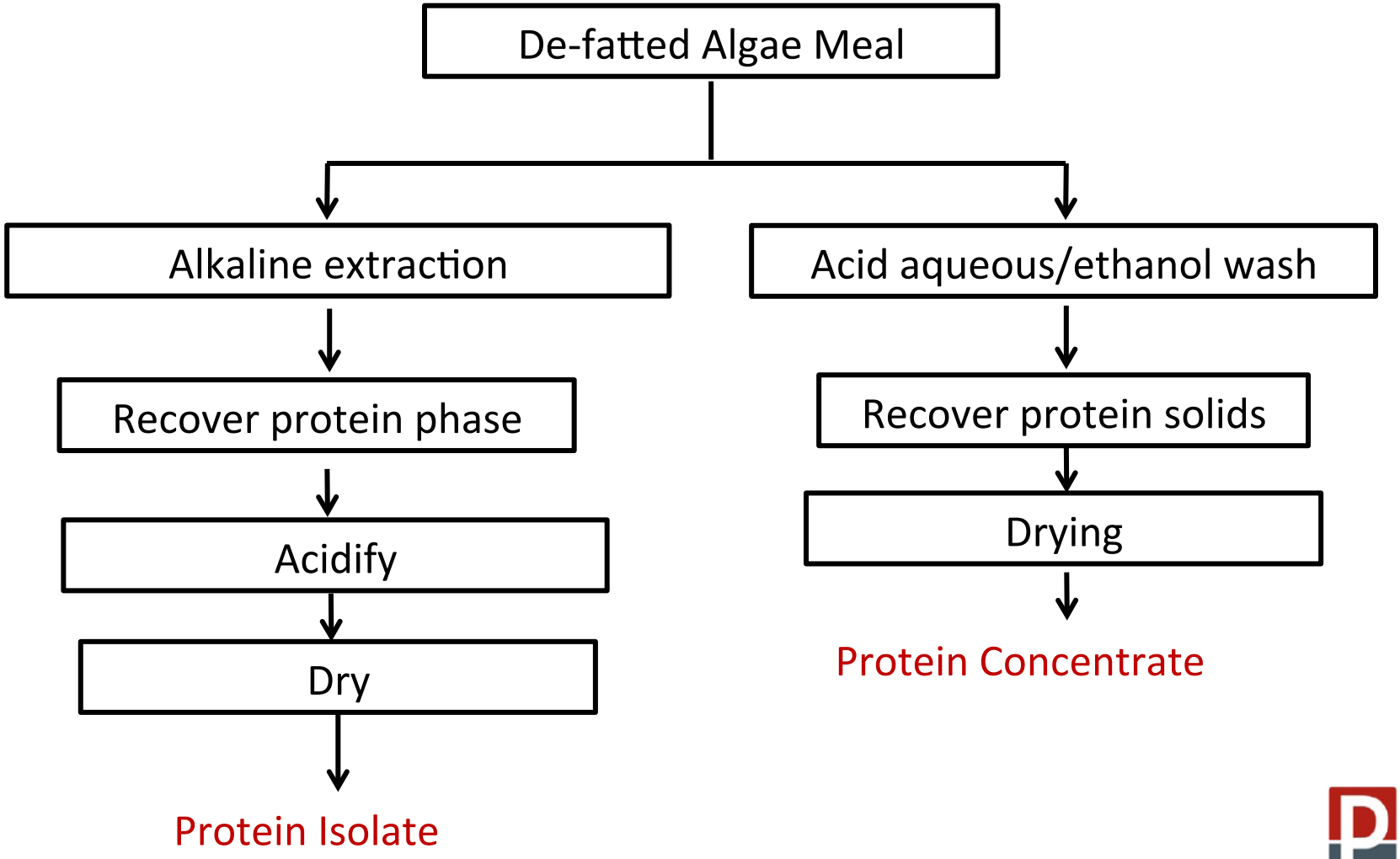
Ceramic Beads (1.25-2.5 mm)

- A large number of minute glass or ceramic beads are vigorously agitated by shaking or stirring

- Disruption occurs by the crushing action of the glass beads as they collide with the cells in solvent

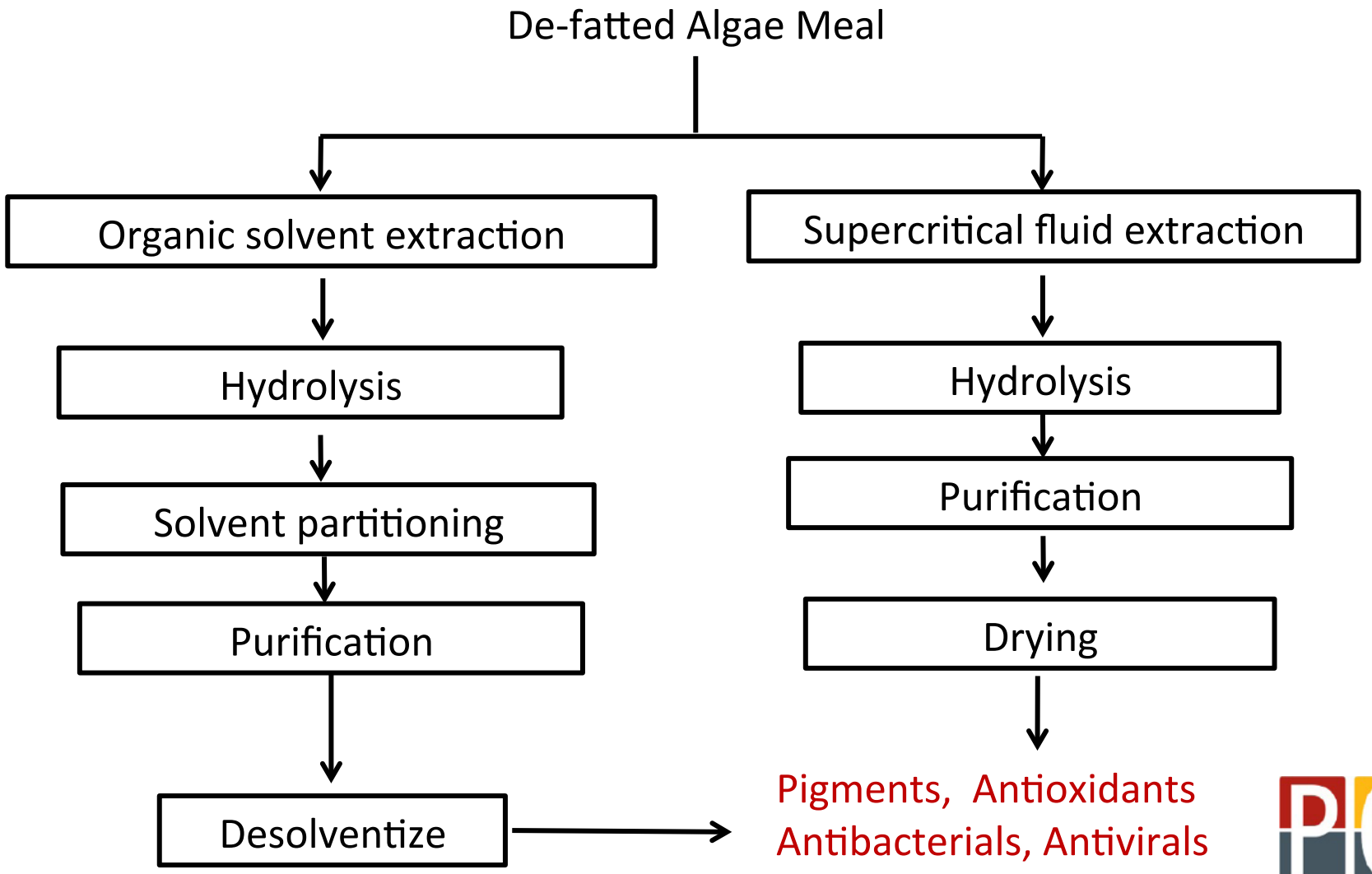
POS BIO-SCIENCES

Protein Concentrates & Isolates



POS BIO-SCIENCES

Bioactives & Pigments from Microalgae



POS BIO-SCIENCES

POS BioSciences Pilot Plant
Saskatoon, Saskatchewan, Canada

POS BIO-SCIENCES

Processing Equipment in Pilot Plant

Microalgae Oil Processing in Pilot Plant

POS
BIO-SCIENCES

Conclusions

- Technology transfer and development based on the inventions originated in academia or research institutions are most efficiently carried out by start-up companies
- There are different models for the operation of start-ups and they are determined by the licence agreement
- CR&D organizations provides multifaceted expertise, industrial size processing equipment combined with laboratories for Q.C. components and managerial system securing Q.A. scheme
- Scaling-up usually requires type of technology and/or processing equipment which is different from one used in the laboratory
- CR&D often act as toll processor providing sufficient amount of new product for market evaluation study
- CR&D are able to deliver “the total package” i.e.: new product-technology-managerial system-marketing-personnel training
- Confidentiality, staff expertise, multifunctional facilities, and track record for delivery of quality services are factors to consider when selecting the CR&D for your project.

Muchas Gracias
por su atención

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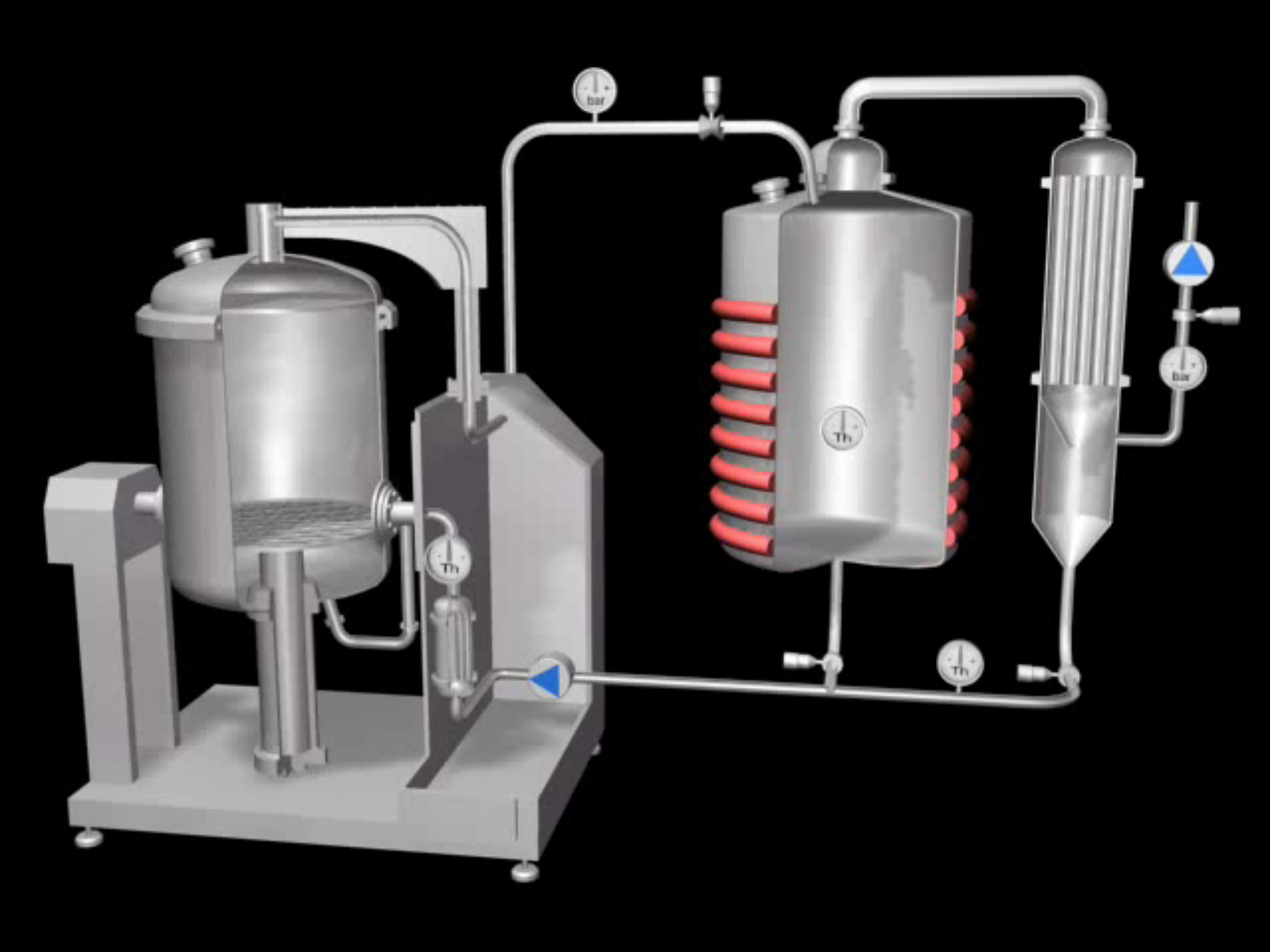
QUOTES

- “When the technology leaves the lab, you’re 5% of the way done”

- “No matter how great you think your technology is, you’re much further away from success then you think”.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