

Extraction of Hydrolyzed Collagen as a Value-Added Product from Poultry Processing Wastewater

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Introduction

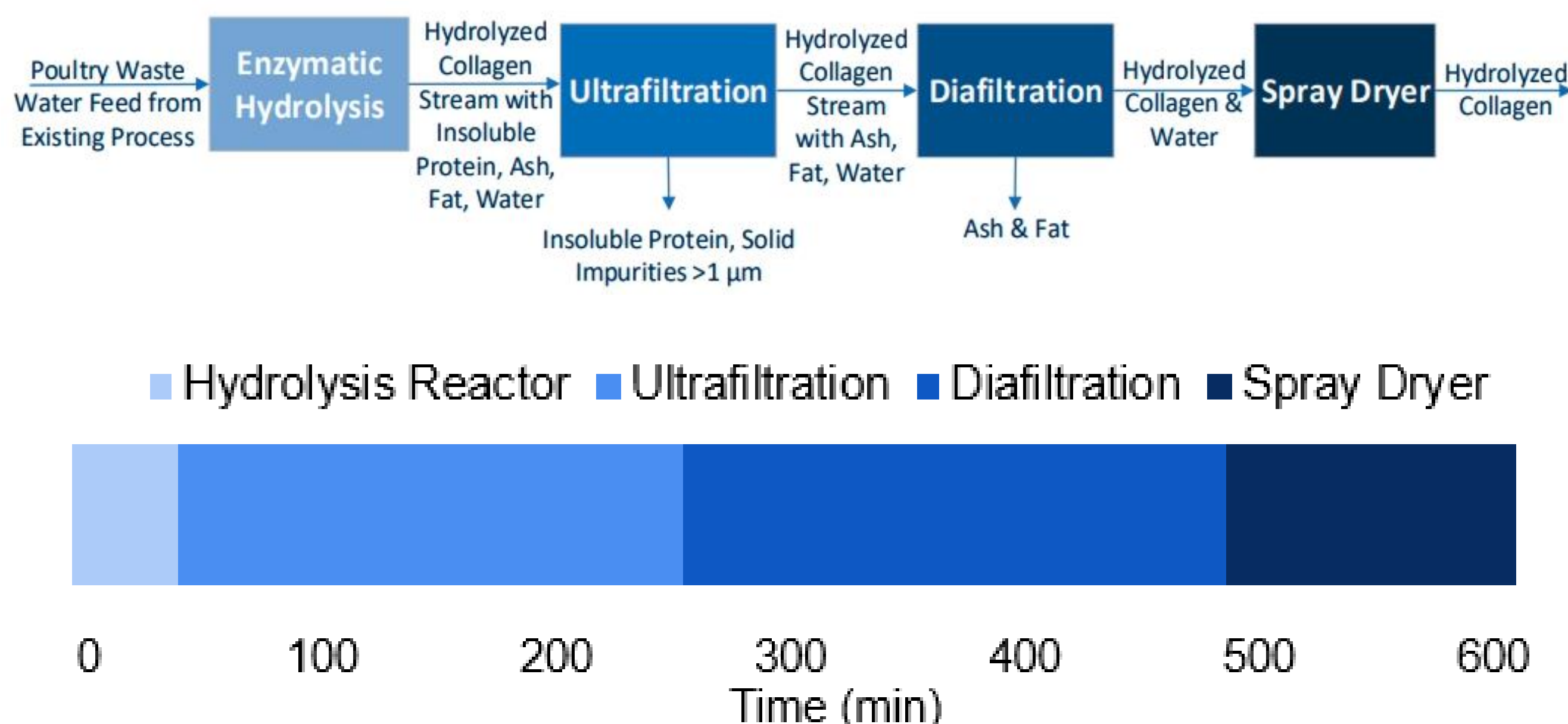
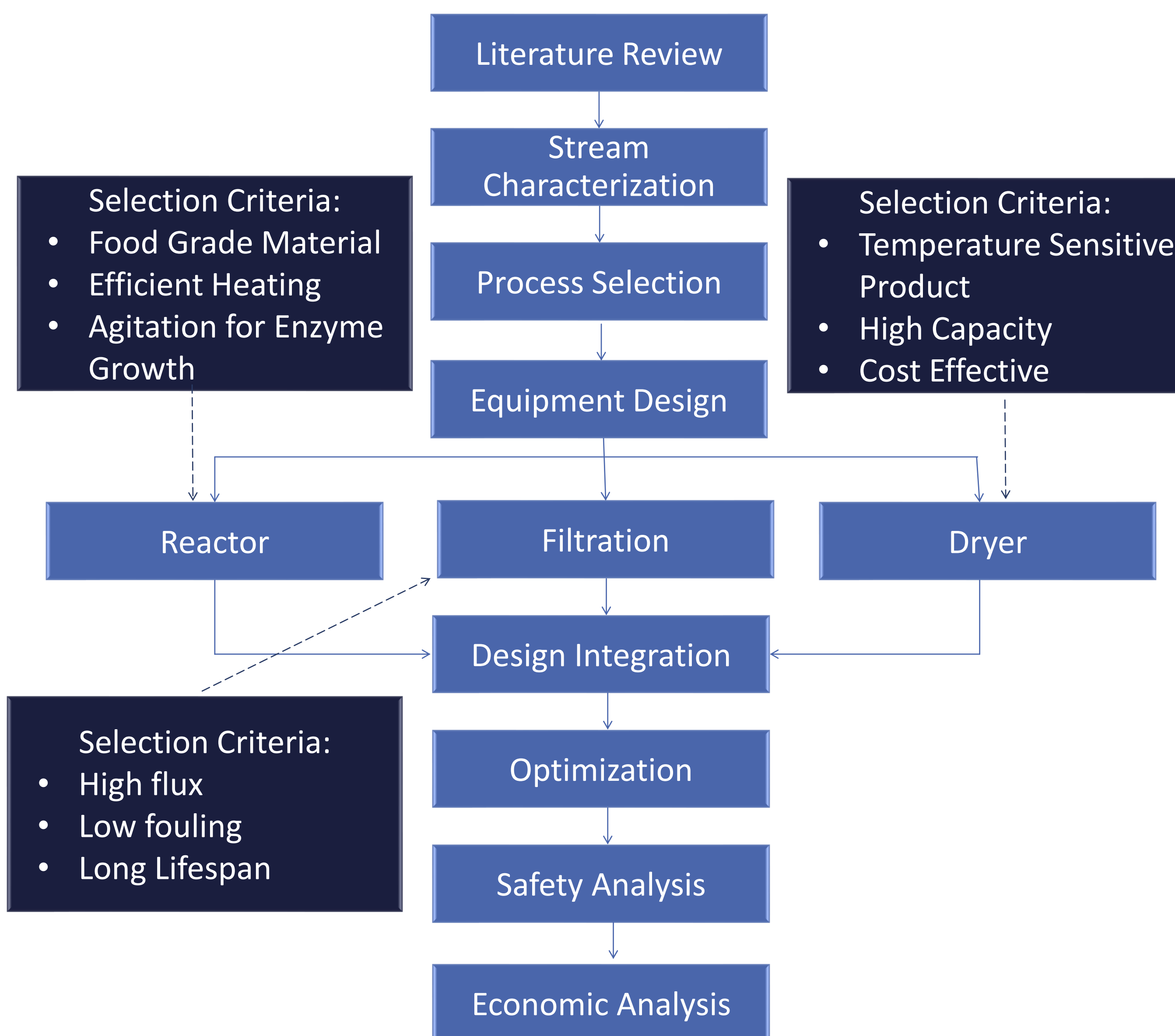
Scotia Garden Seafood

- Currently converts the wastes from chicken processing into meal for aquaculture (\$1/kg).
- Interested in extracting collagen (\$53.26/kg^[1]) as a value-added product for additional revenue.

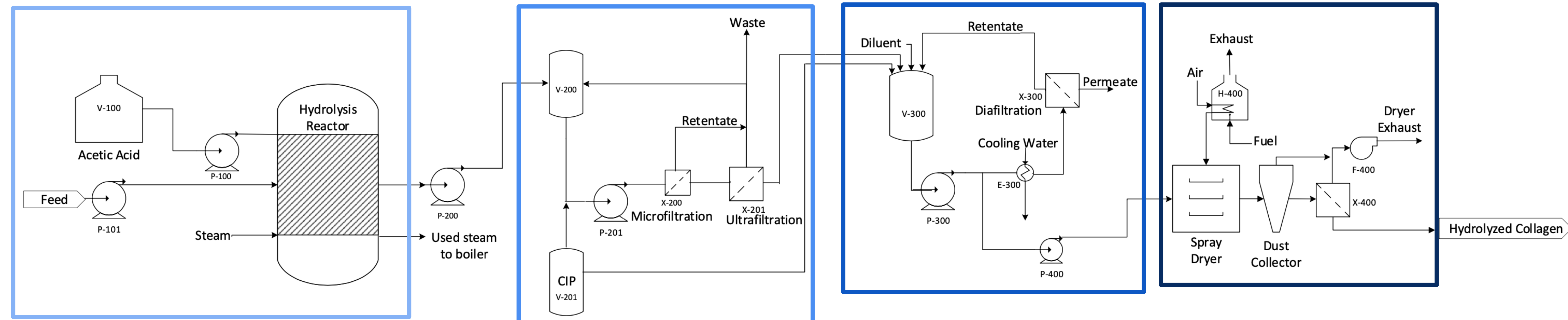
Objectives

- Isolate and extract collagen from poultry wastewater.
- 90% pure product with a maximum moisture content of 5%.
- Process must be sustainable and economically viable.

Design Process

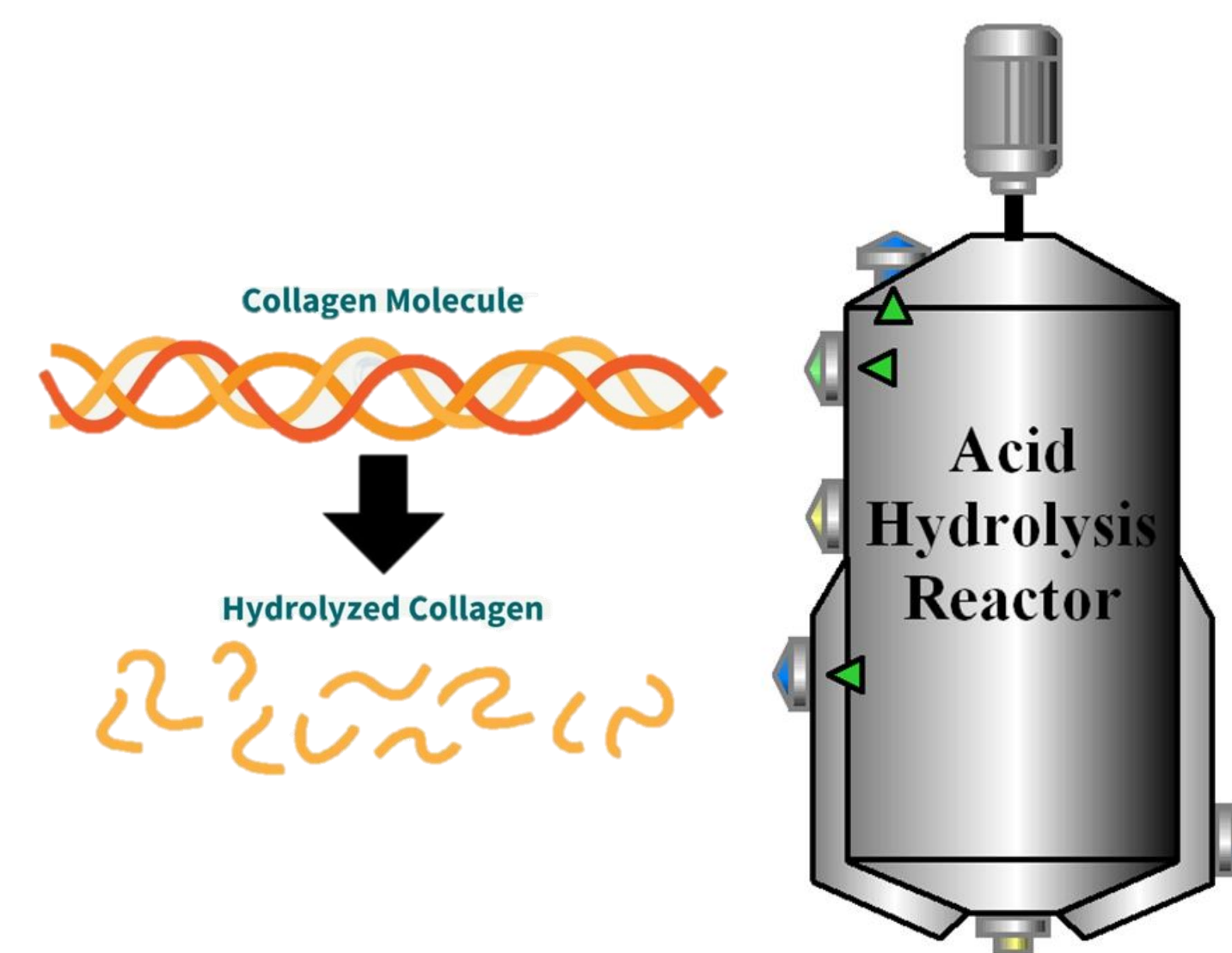


Design Overview



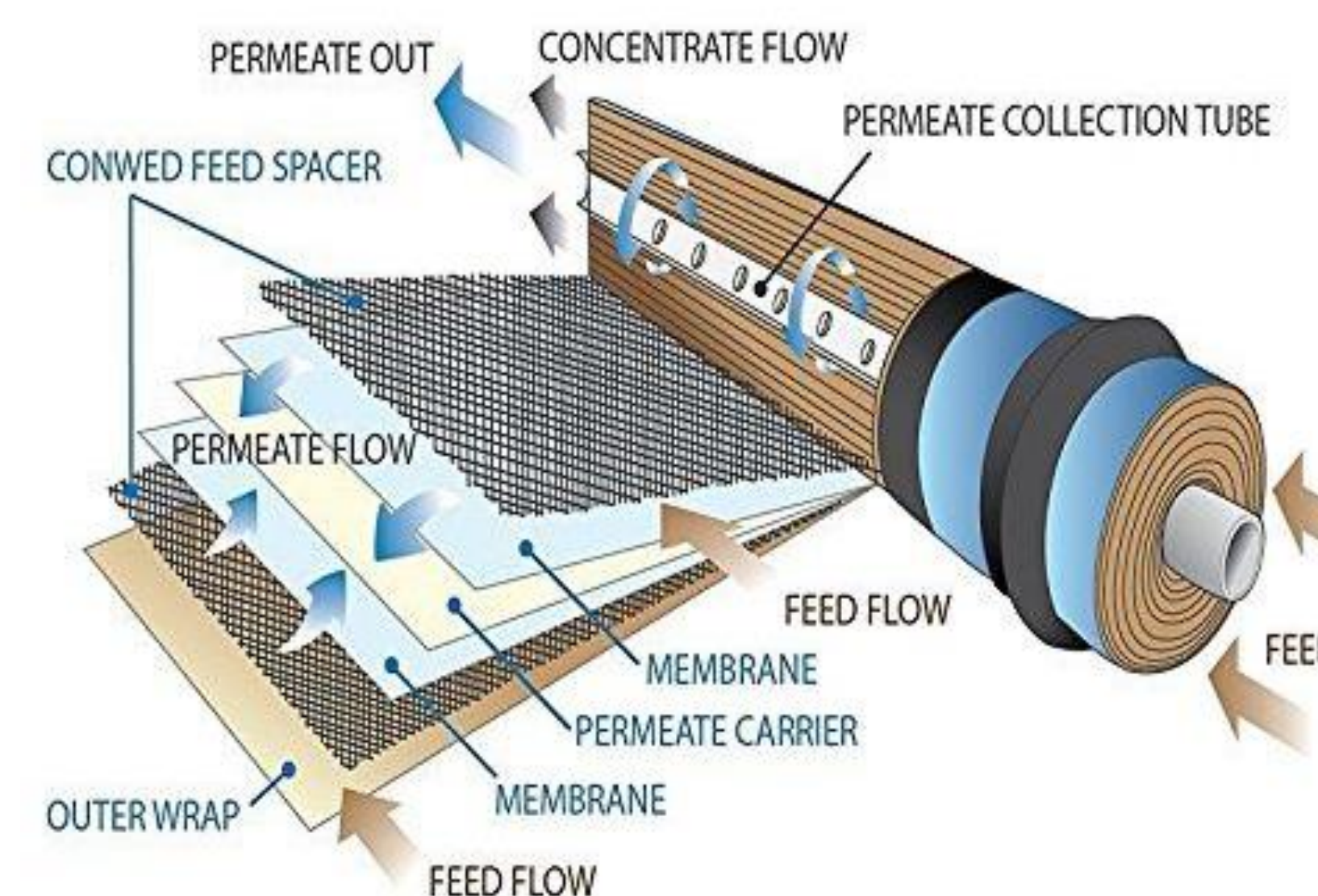
1 Hydrolysis Reactor

- A hydrolysis reactor is designed to convert collagen to hydrolyzed collagen in a batch process.
- 27,700 kg of poultry processing wastewater is processed per day.



2 Ultrafiltration

- An ultrafiltration batch process is to remove unhydrolyzed collagen and any large (>1 μm) residual particles.

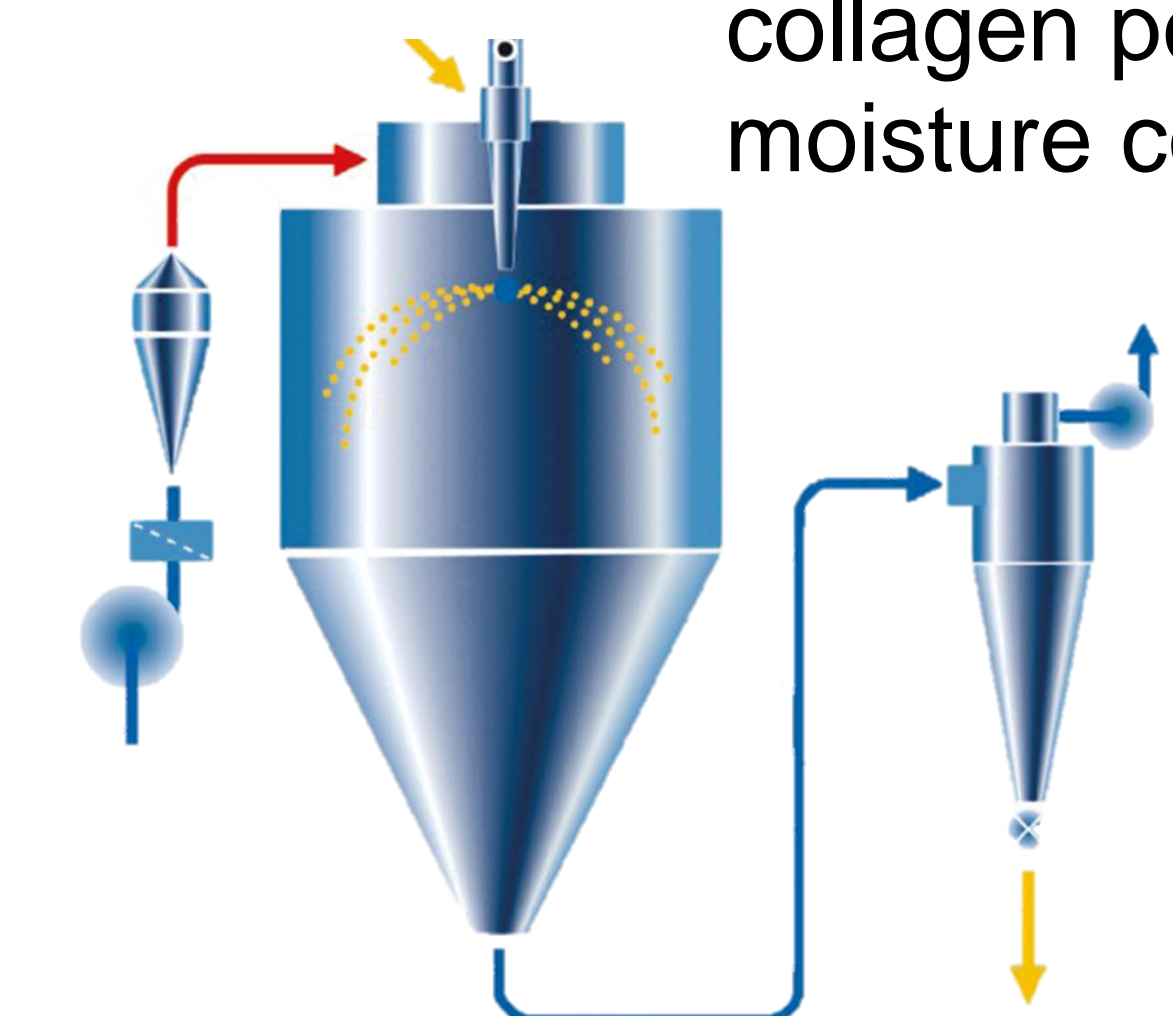


3 Diafiltration

- A diafiltration batch process is used to separate the ash and fats from the hydrolyzed collagen.

4 Drying

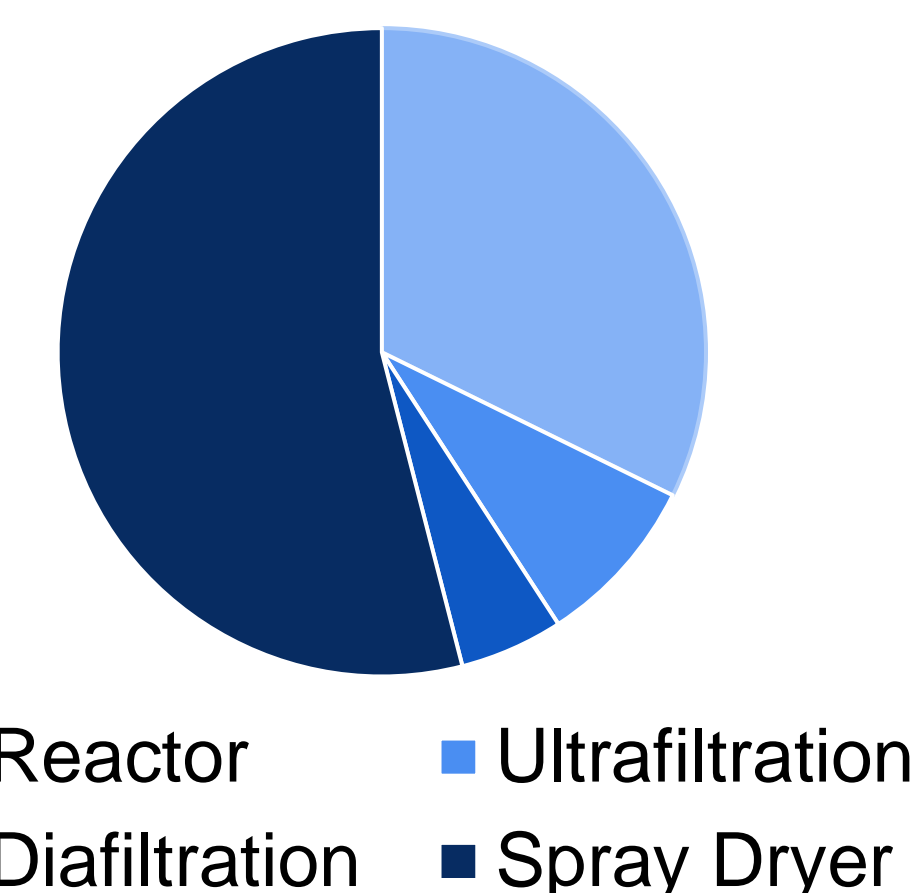
- A spray dryer is used to obtain a final product of dry hydrolyzed collagen.
- The overall process produces 344 kg/day of 90.3% pure hydrolyzed collagen powder with a moisture content of 3.5%.



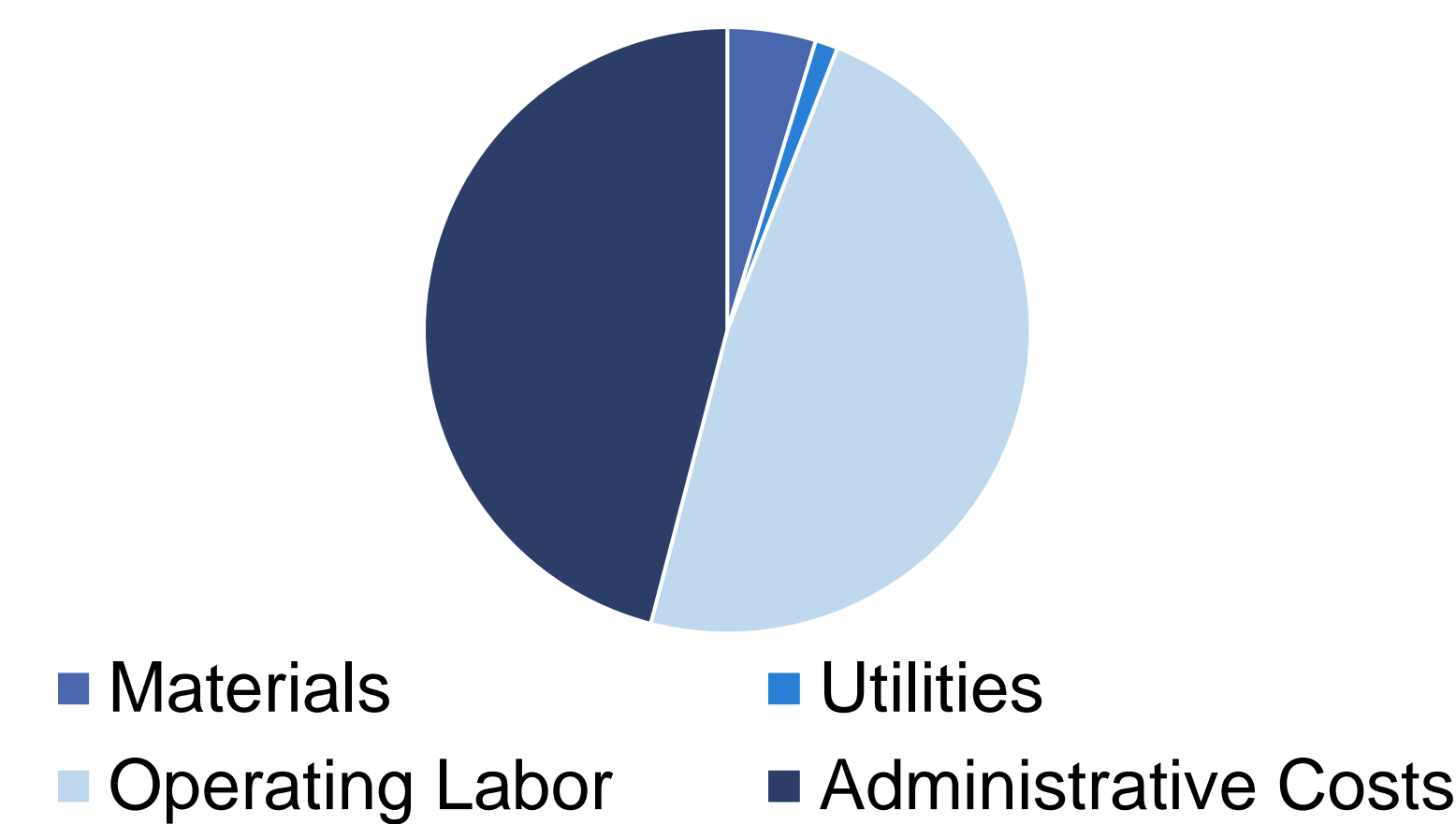
Economic Analysis

- The estimated capital cost for this project is \$4,503,000 with an annual operating cost of \$1,764,475. The annual revenue is \$3,343,663.

Project Capital Cost



Annual Cost of Manufacturing



Conclusions

- The leading **safety** concern for this process is dust generated from the spray dryer, which creates a risk for dust fires and explosions.
- **Sustainability** concerns include greenhouse gas emissions from the heater and particulate emissions from spray dryer. The waste generated from the two filtration steps is recycled back into meal production.
- The **payback period** for the proposed process is 7 years.
- **Future work** includes design of a packaging process, integrating heat recovery, and integrating the design into the current plant layout.

[1] Bulk Supplements. (2021). Hydrolyzed chicken collagen. <https://www.bulk-supplements.com/products/hydrolyzed-chicken-collagen-powder>