

PROJECT SCOPE

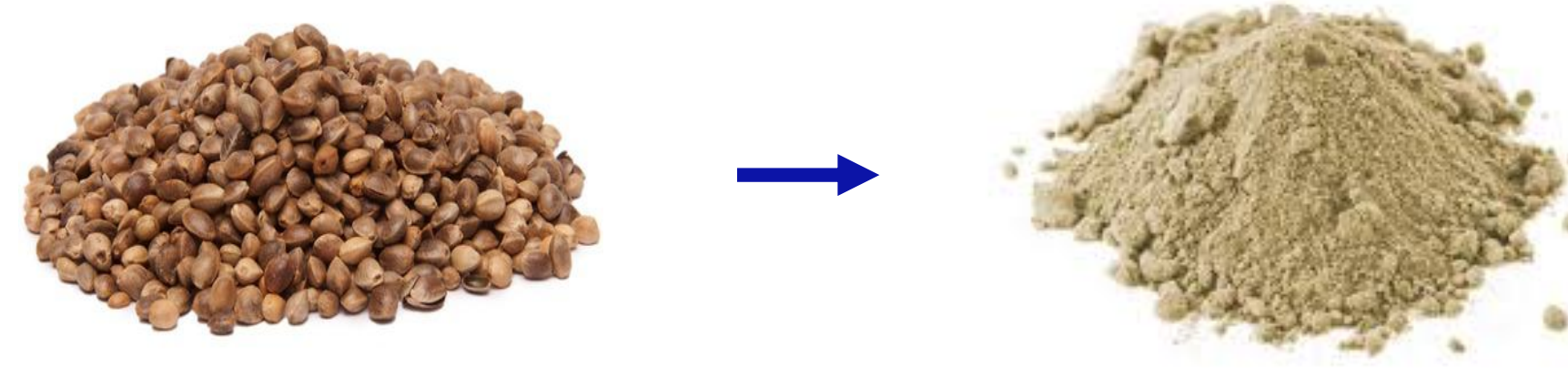
Design a process that produces hemp protein isolate and increases the current protein content from 50% to at least 80% at a rate of 64 kg/hr for Giffin Technologies. The final product must be safe for consumption, and the process must be economically feasible and easy to operate.

BACKGROUND

Hemp seeds are widely used for their oil content. The defatted residue of the seed composition is given below.

COMPOUND	%
Protein	50.00
Fiber	16.67
Phytates	6.90
Others	26.43

Two major fractions of proteins in hemp are albumin (20%) and globulin (80%) which are easily digestible.



PROCESS STEPS

Solubilisation: Defatted hemp seed meal is introduced into a tank composed of an alkali solution to solubilize the protein content and to keep the insoluble material in suspension.

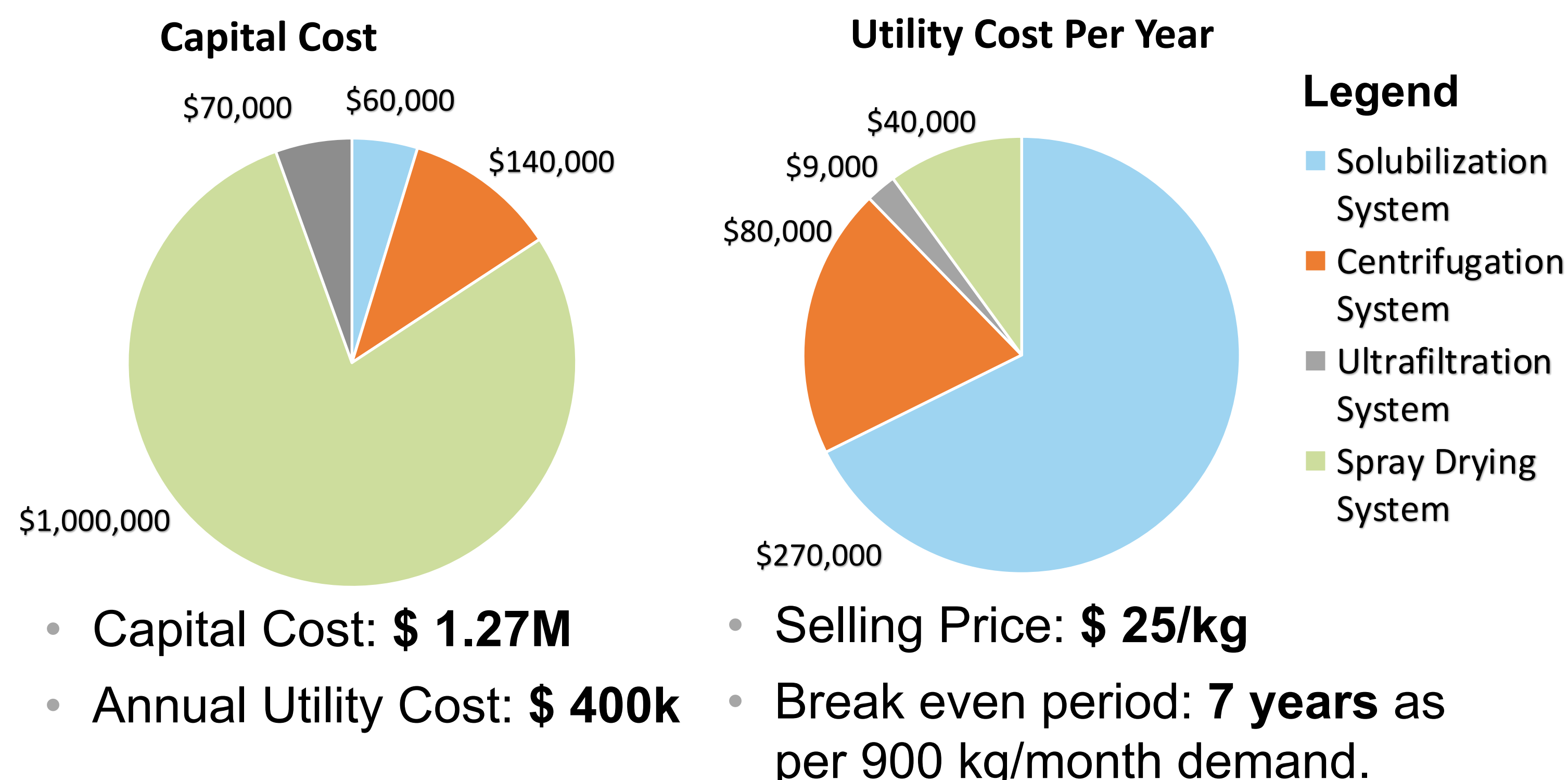
Disc Centrifugation: A disc centrifuge is used to remove the insoluble materials such as fibers while supernatant containing proteins proceeds to the next unit operation.

Ultrafiltration & Diafiltration: Antinutritional contents are removed through the permeate whereas retentate containing the protein proceeds to the next unit.

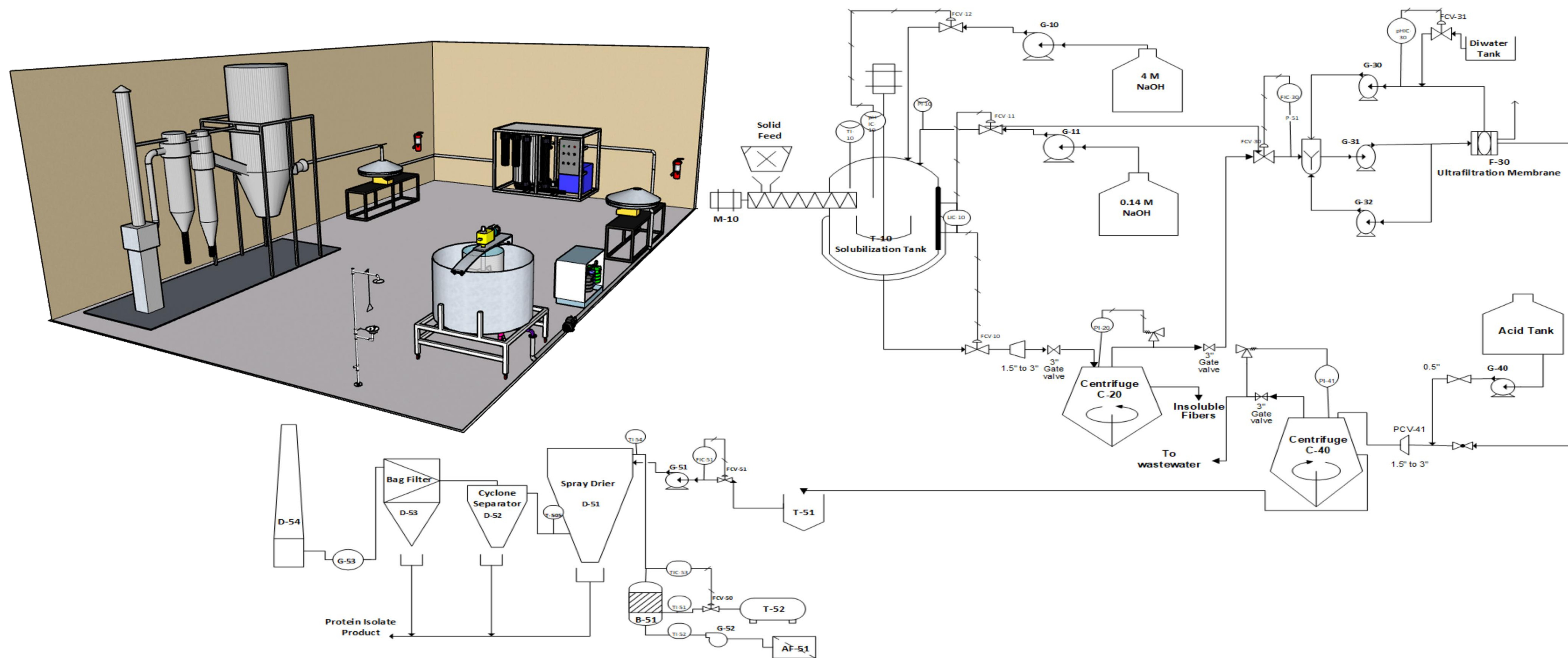
Isoelectric Centrifugation: The retentate pH is then reduced to the isoelectric point of protein at a pH of 5, making the protein insoluble. It is then fed to a centrifuge once again.

Spray Dryer: The input protein slurry is transformed to its final dry powder form.

ECONOMIC ANALYSIS

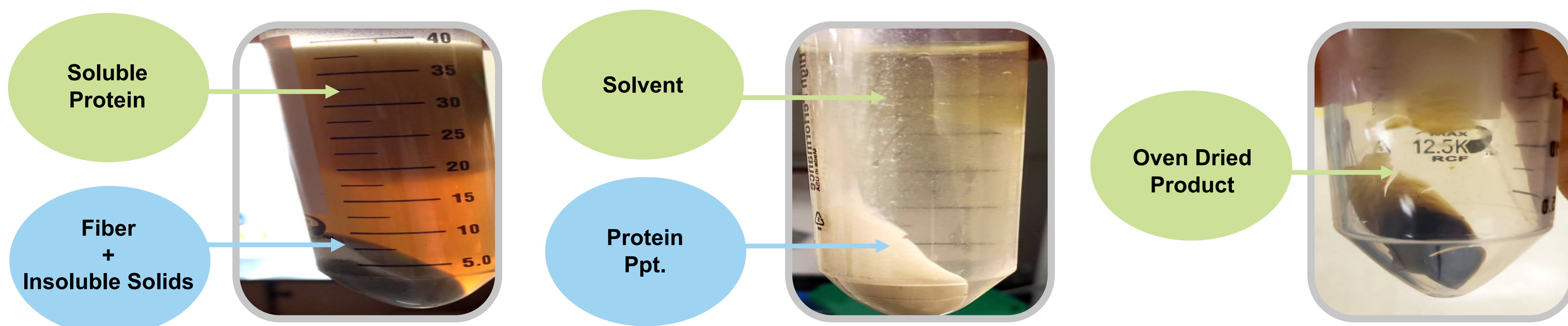


PROCESS OVERVIEW



LABORATORY EXPERIMENT

- An experiment was conducted to test the effect of omitting the filtration unit on the final product quality. The purpose is to reduce overall process cost and to simplify the operation.
- The experiment replicates the alkali method with the exception of the filtration steps.
- The samples were sent to the laboratory for analysis of protein, phytate and phenol contents.



CONCLUSION & RECOMMENDATIONS

- For the scope of the project, alkaline extraction process was chosen and a continuous operation was designed to produce hemp meal protein.
- The process is feasible for the extraction and concentration of hemp meal protein.
- Process is economically viable with a breakeven period of 7 years requiring a capital investment of 1.3 million.
- A plant alternative to animal raw materials was utilized successfully for protein powder production.
- Future steps include, consideration of omitting the filtration unit contingent to the laboratory results. If acceptable limits of antinutritional contents is observed and taste is not negatively affected, the unit will be omitted.