



Tofflon

Bioprocess Platform in the Health Field

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Tofflon Science and Technology Group Co.,Ltd.



Trends in the field of Healthy



Biopharmaceuticals



Food



**Medical apparatus
and instruments**



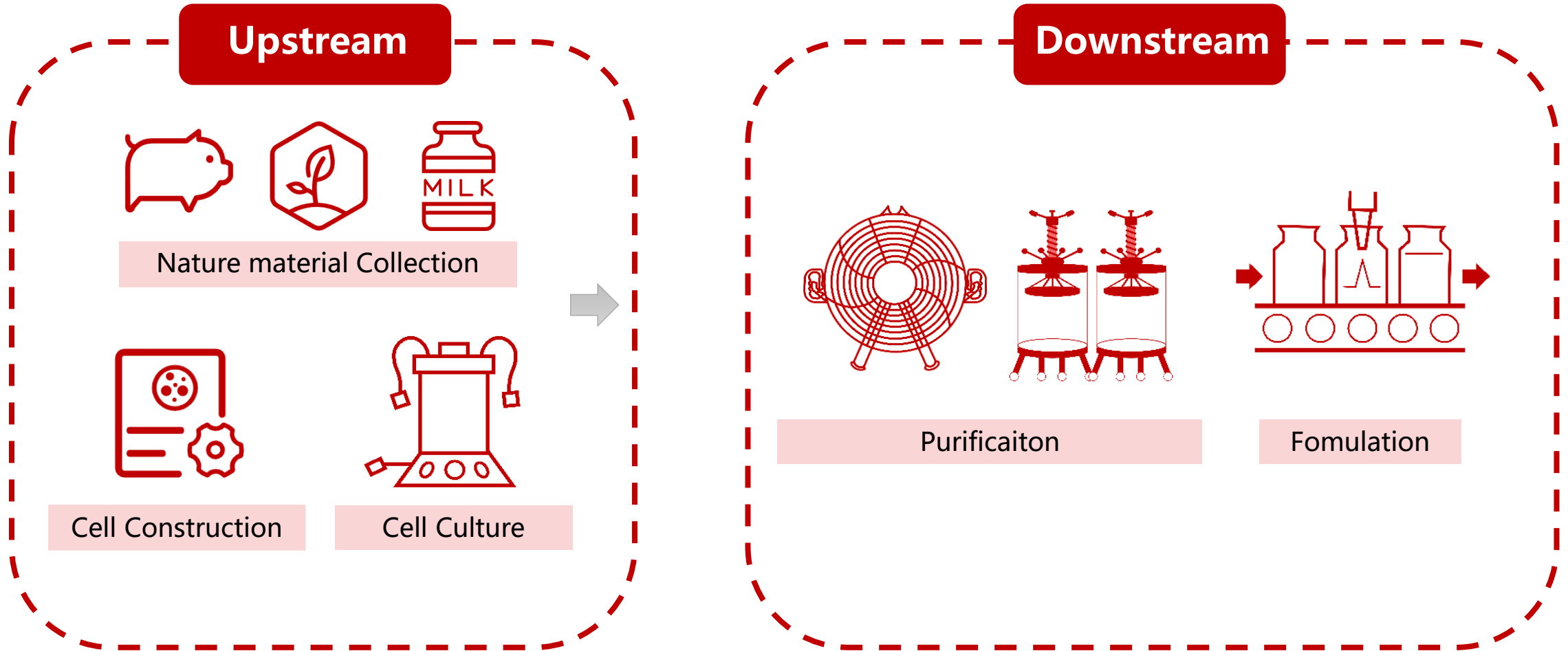
Cosmetics

From Nature or Chemical synthesis, to **Biotechnology**

Biotechnology

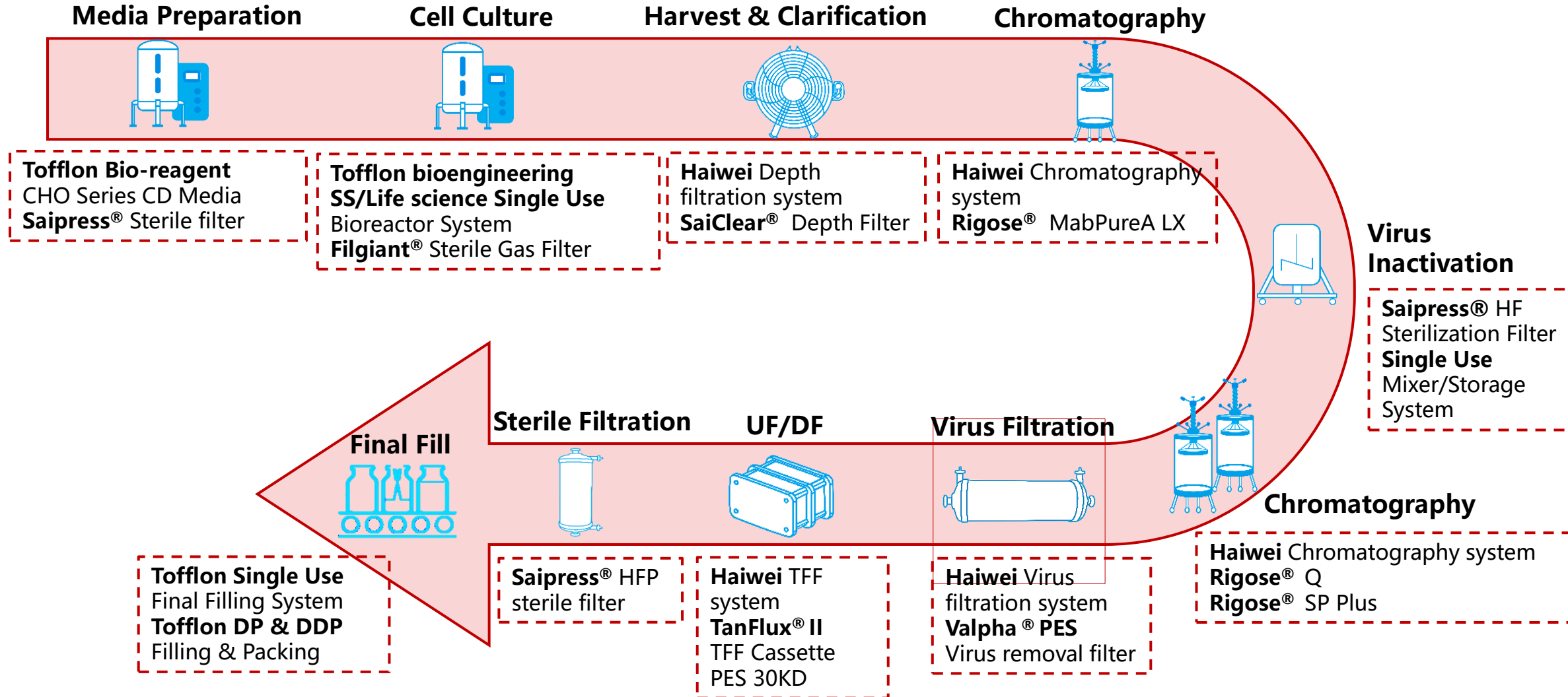
Fermentation engineering
Enzyme engineering
Metabolic Engineering
Cell Engineering
Microbiology
Synthetic biology
... ..

Protein
Functional sugar
oligonucleotide
... ..



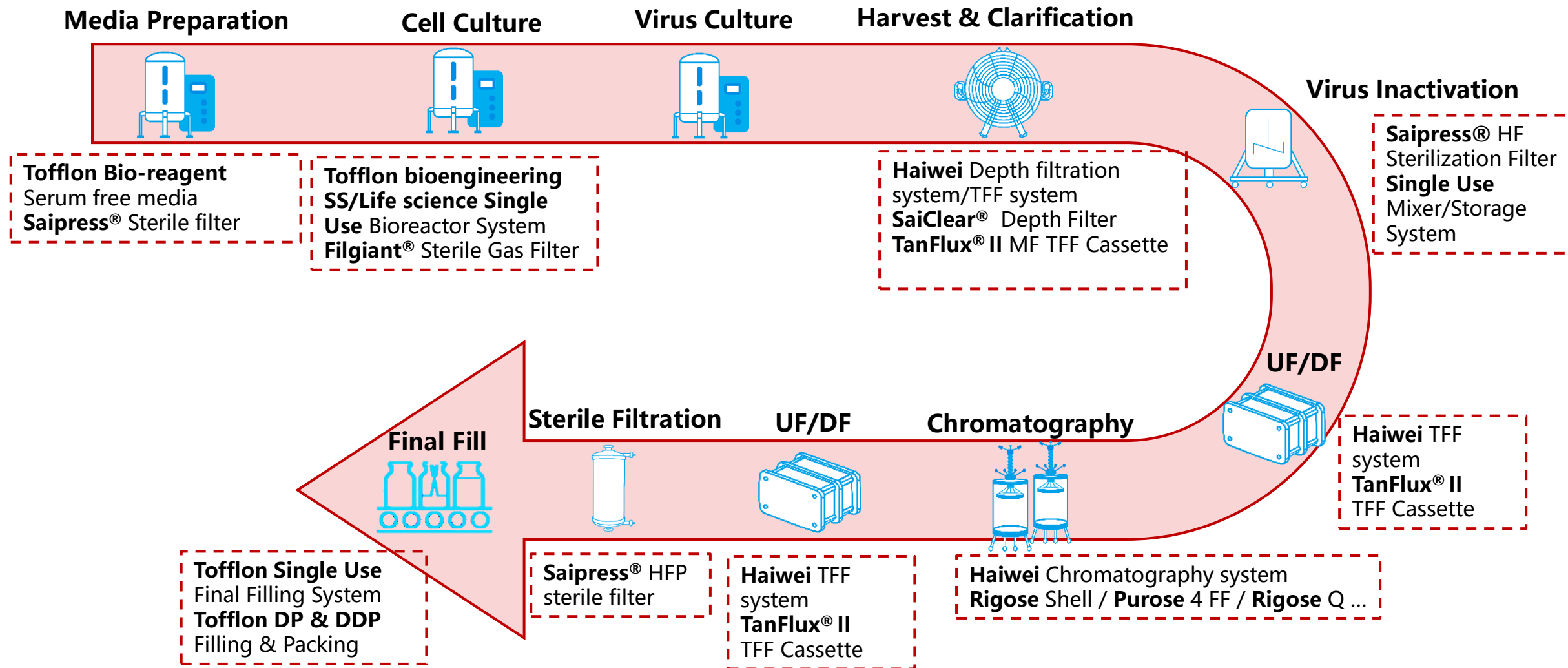
Mature Process Solution in Biopharma

Process Solution for mAb



Mature Process Solution in Biopharma

Process Solution for Inactivated Vaccine/attenuated live vaccine



Technology

- ◆ **Upstream Genetic Technology; Culture/Fermentation Technology**
- ◆ **Downstream Bioseparation Technology (Centrifugation, Filtration, Chromatography, Drying)**



Engineering

- ◆ **Process design;**
- ◆ **Equipment selection and assembly**

Economic evaluation

- ◆ **Material balance**
- ◆ **Cost and economic benefit assessment**

How to get Finished Product from Natural Raw Material / Cell ?

Lab scale R&D



Pilot Experiment



Industrial manufacture



- ◆ Rational experimental scheme
- ◆ Complete experimental equipment
- ◆ Abundant experimental experience

- ◆ Accurate economic accounting
- ◆ Accurate process control
- ◆ Accurate process amplification

Lab scale R&D



Upstream Cell culture / E.coli or yeast fermentation

- ◆ Tofflon Life Science/ Bio-reagent Technical team (provide Media with **Cell culture technology**)
- ◆ Tofflon Bioengineering Technical team (provide fermenter with **fermentation technology**)
- ◆ Technical team from Jiangnan University (provide optimization of **fermentation process**)

Downstream Bio-separation & Purification

- ◆ Tofflon Qianchun Technical team (provide Resins with **chromatography technology**)
- ◆ Tofflon Saip Technical team (provide Filters with **filtration technology**)

How to Develop a Bioprocess

Pilot Experiment



- ◆ Technical team for the project transfer from lab scale development
- ◆ Standard **pilot site conditions**, complete **pilot equipment** and **pilot consumables**

Industrial manufacture



- ◆ Precise **engineering design**, full set of **production equipment and consumables**, ensure consistency with pilot experiment
- ◆ Technical team to site, ensure the success of the whole project

Bioprocess in Food field

Case Share: Food Protein by Yeast Fermentation

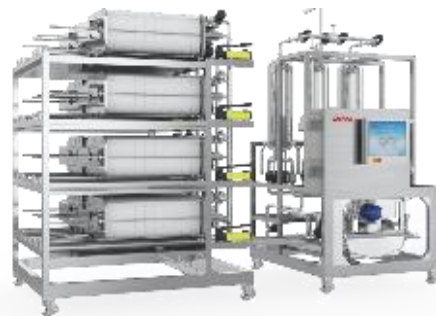
Fermentation

Clarification

Chromatography

Ultrafiltration

Freeze/Spray Drying



- ✓ To get high concentration of target protein
- ✓ From 50L Up to 130T

- ✓ To remove bacteria and solid impurities
- ✓ Centrifugation, or Ceramic Filtration

- ✓ Critical step, to obtain the high purity of the target protein by optimizing the resin purification process
- ✓ Ion-exchange Chromatography

- ✓ Concentrated and replaced solutions
- ✓ Ceramic Ultrafiltration, Plate membrane Ultra-filtration

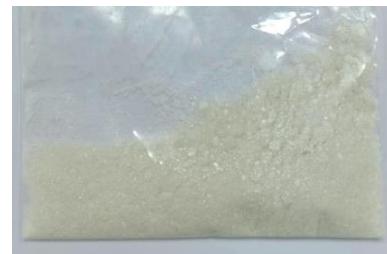
Bioprocess in Food field

Case Share: Food Protein by Yeast Fermentation

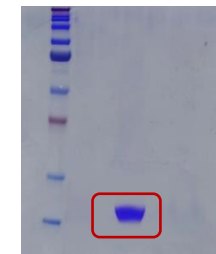


Lab Scale

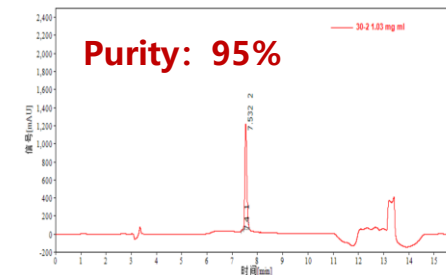
- ◆ Determine the main process especially **Chromatography** for downstream process
- ◆ Requirements for finished products: Recovery >80%, Purity > 90%



Freeze-dried product



SDS-Page



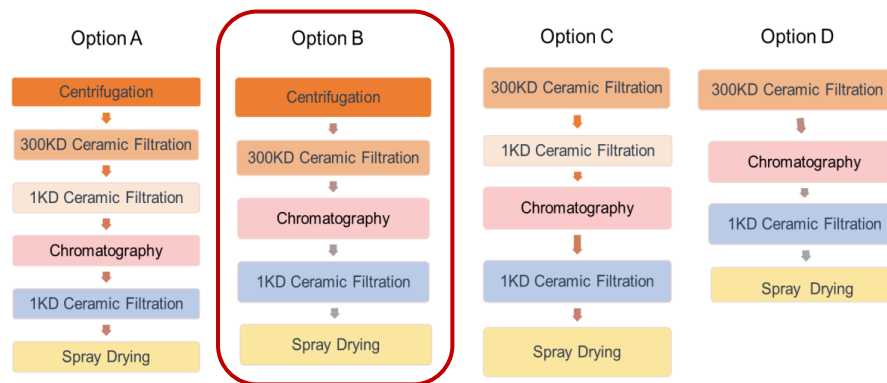
HPLC result

Purity: 95%



Pilot Scale

- ◆ Determine the clarification method for Large scale manufacture
- ◆ Verifying the data from lab scale experiment



Factors to consider

- ✓ Protein purification
- ✓ Protein recovery
- ✓ Process time
- ✓ Cost

Option B is the best:
Purity: 94.6%
Recovery: 85.0%



Industrial Scale

- ◆ Expanding to large scale such as 25T and 130T
- ◆ Output the Integrated Solutions (M+E+C)

Proposal designing in Progress

Bioprocess in Food field

Case Share: Food Protein from Nature Resource

Degrease

Cation exchange1

Micro-filtration

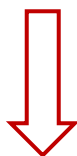
Cation exchange2

Ultra-filtration

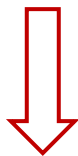
Anion exchange



Milk



Lactoferrin



Casein



α -lactalbumin

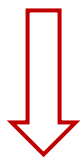


β -lactoglobulin

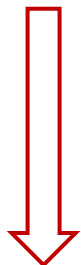
Bioprocess in Food field

Case Share: Food Protein from Nature Resource

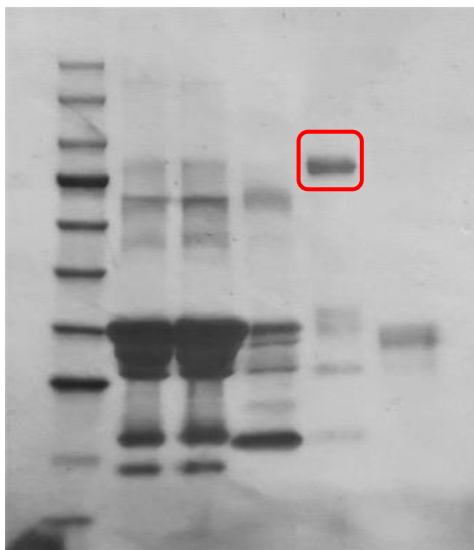
Lab Scale



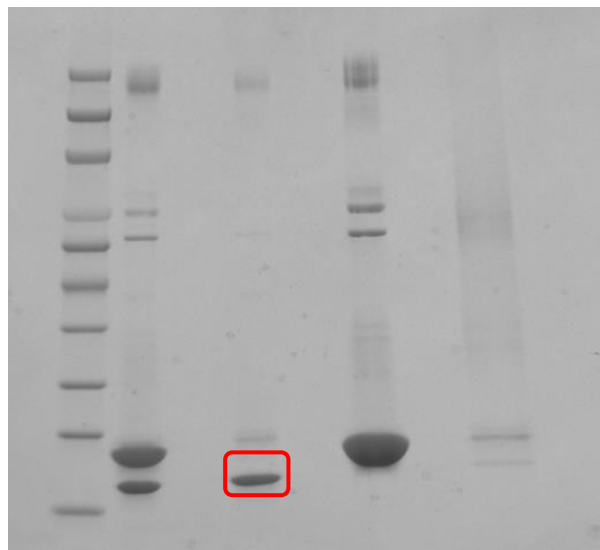
Pilot Scale



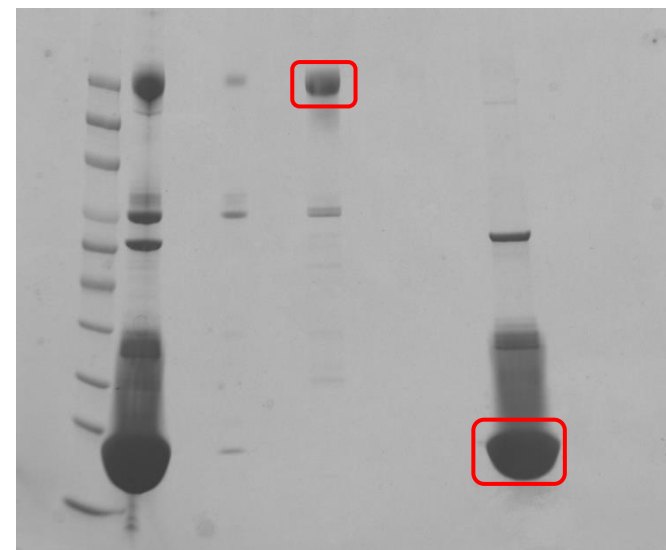
Industrial Scale



Lactoferrin
Purity: 83.2%
Recovery: 87.8%



α-lactalbumin
Purity : 72.1%
Recovery: 91.4%



IgG(left)
Purity : 86.9%
Recovery: 58.4%

β-lactoglobulin (right)
Purity : 80.2%
Recovery: 73.5%

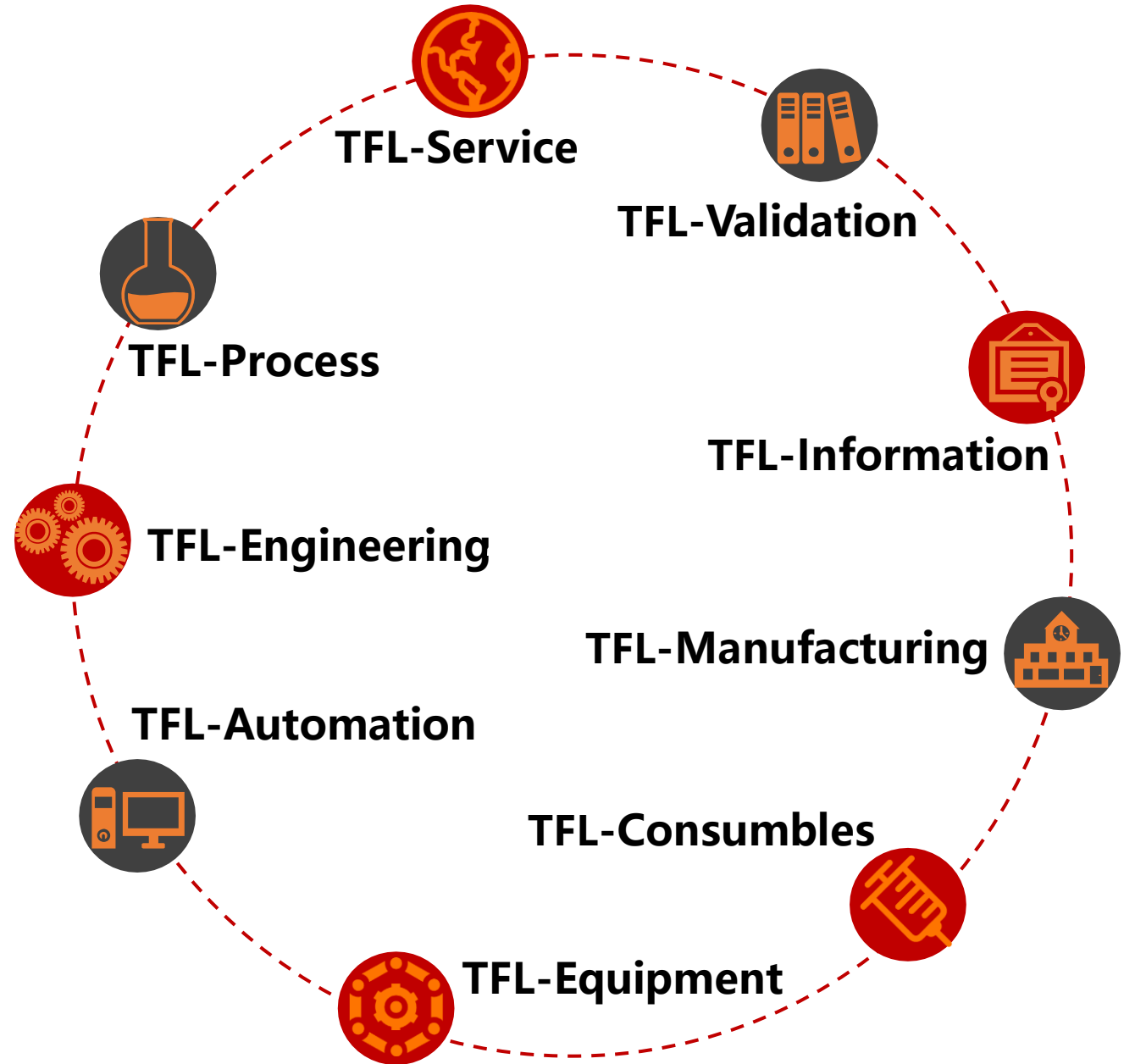
Capacity(for One of the top five dairy producers in the world):

60 Tons of Milk /Day

300 Tons of Milk /Day in the future

Tofflon Bio-Platform

- ◆ **Global Regulation Compliance**
- ◆ **Satisfied Process**
- ◆ **Successful Engineering**
- ◆ **Cost-Competitive Production**
- ◆ **Easy Operation & Maintenance**



Tofflon Biopharma Enterprise Solution

Bio Tech

Bio Process

Bio Pharma

Cryopreservation



LN2 Storage System

Seed Cultivation



CES System(10L-200L)

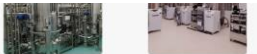
Cultivation



Bioreaction System



Bio-Vessel and Pipe System



SS Bioreactor/
Fermenter
(50L-20KL)



Single Use
Bioreactor
(50L-2000L)

Filtration



Deep-filtration System



Hollow Fiber

Purification



Chromatography System



Chromatography System



Chromatograph System(Lab-Scale)



Chromatography Colum(Manual)



Chromatography Colum(Auto)

Virus Removal



Virus Removal Filtration

Concentrate Replacement



Ultrafiltration

Solution Frozen



Freeze & Thaw



Inactivation System

DS

DC



Cell preservation solution

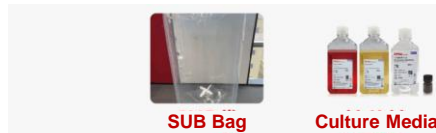


Cryopreservation tubes



Culture Media

Disposable cell culture bags



SUB Bag

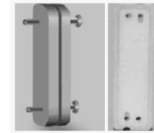
Culture Media



Chromatography Resin



Fixture



Membrane



Freeze & Thaw Bag

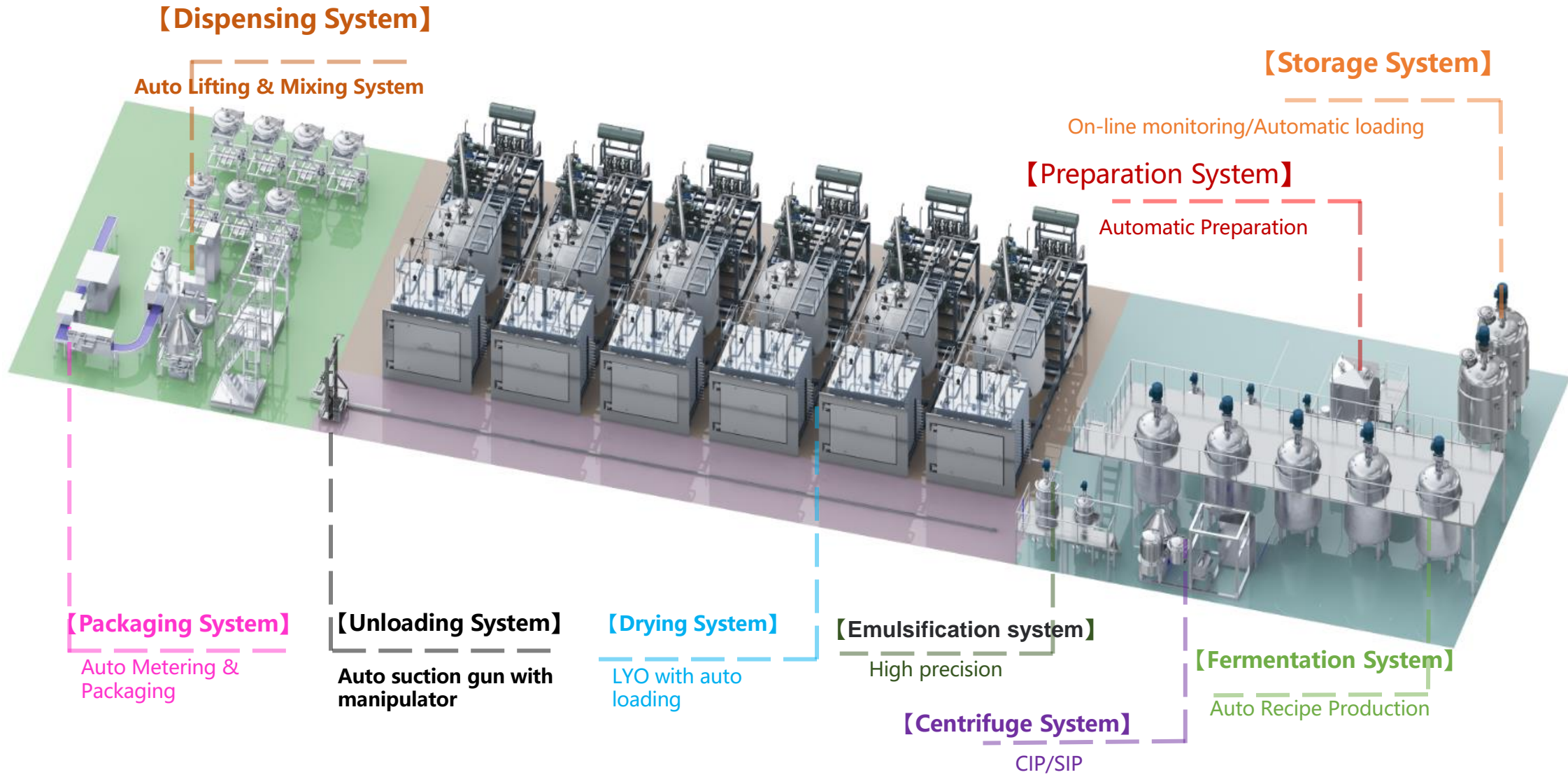


Bag Mouth



C-FLEX Pipe

Tofflon API Enterprise Solution





Tofflon Dongtai



Tofflon Jinshan



Tofflon 3rd Plant



Tofflon OSD



Tofflon 5th Plant



Tofflon Wuhan



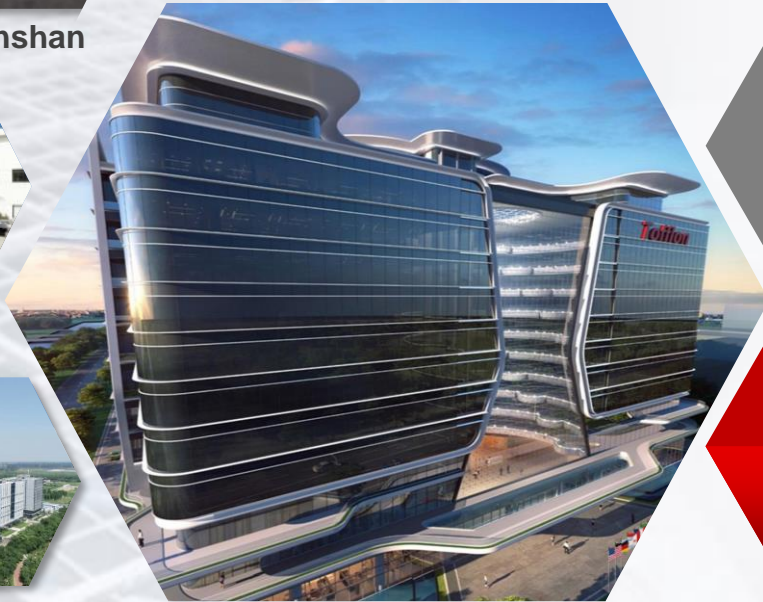
Tofflon Hangzhou



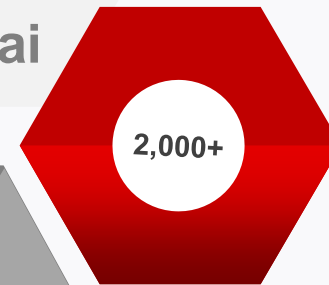
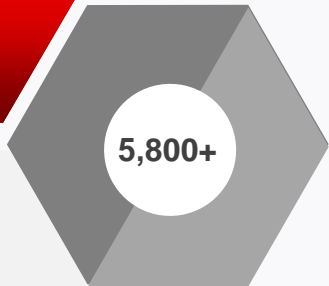
Tofflon India



Tofflon Italy



USD 800 Million Revenue
(FY 2022)



Leading Brand in China
Pharmaceutical Equipment Market

Since
1993
Shanghai

Over 15 Manufacturing
Plants all around the world
(11 in China, 4 Overseas)

Serving **over 3000**
pharmaceutical companies
worldwide

5800+ Professionals

2000+ Patented Technologies
200 Software Copyrights

All for Customers

