

Tofflon



Cell Expansion System

Tofflon Life Science Co.,Ltd.



Founded in 1993, Tofflon Science and Technology Group Co., Ltd. (SZ:300171) is a pioneering Chinese enterprise in the field of biotechnology, with a rich history of 30 years. With annual sales reaching 5.4 billion RMB in 2022 and a global workforce of 5,500 employees, Tofflon has established over 50 offices worldwide, embodying a globalized business and team.

Tofflon Life Sciences Co., Ltd., the flagship subsidiary within the group, plays a pivotal role in their portfolio. It focuses on the research and development of cutting-edge technologies in the biopharmaceutical and life science industries. As a strategic division Tofflon life science provides one-stop solutions and services that integrate bioprocessing equipment, core consumables like sterile bags, culture media, resins to further enquire and professionally.

- In the realm of cell therapy, we offer complete solutions for the preparation and production of immune cell pipelines, stem cell pipelines, tumor cell vaccines, and more.
- For gene therapy, we provide overall solutions for the research, development, and industrialization of nucleic acid drugs (mRNA/DNA) and viral vector drugs.
- In the field of biological sample banking, we conduct research and development of automatic sample storage management systems to provide comprehensive solutions for cell seed and tissue samples.
- In the consumables sector, we have developed a complete range of products including disposable bags (culture bags, mixing bags, storage bags), bio-reagents (culture media, cryoprotectants, Ficoll, growth factors), resin (GFC, AC, AEX, CEX, HIC, MMC), filtration (microfiltration, deep filtration, TFF, cassette), and hard packaging materials.
- We also focus on disinfection, offering comprehensive solutions for clean room disinfection, surface and external disinfection, infection control, terminal disinfection, and multi-drug resistant microorganism disinfection, ensuring effective environmental disinfection.

Leveraging Tofflon Group's extensive expertise in design, manufacturing, engineering construction, and after-sales service worldwide, Tofflon Life Sciences Division is committed to serving the biopharmaceutical industry with enhanced speed and professionalism.

Cell expansion system

The Cell expansion system (CES) is designed for antibody drug seed amplification and vaccine production applications. The system provides good mixing and ventilation through rocking technology. The system ensures a sterile environment and reduces the risk of contamination through disposable biological bags.

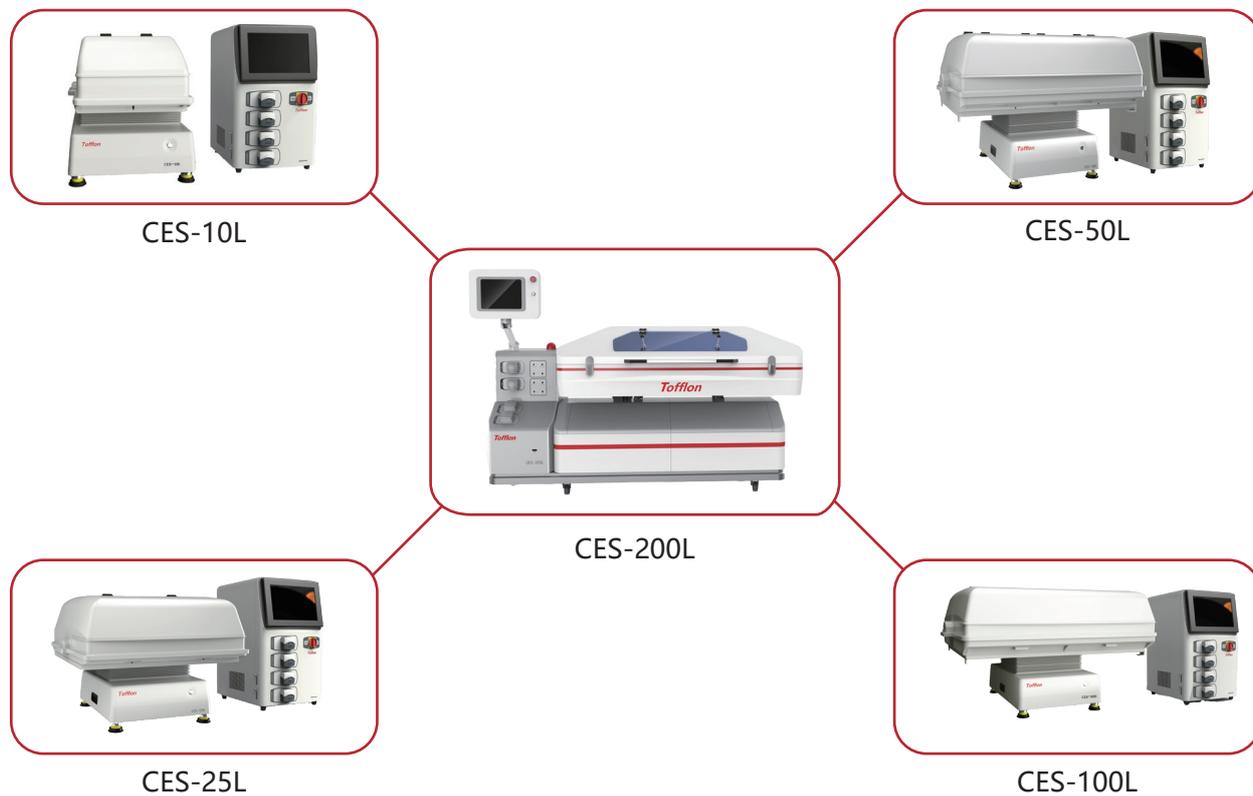
As a general-purpose cell culture and fermentation technology platform, the system provides reliable and accurate performance throughout the research, process development and production environment. Batch culture mode or perfusion culture mode can be used to obtain more cells and higher expression quantity, which is convenient for cell amplification culture.



Features of CES

- ✔ Suitable for almost all the cell culture applications.
- ✔ Suitable for different culture strategy, like batch culture, fed-batch culture and perfusion culture.
- ✔ Suitable for suspension culture, flake carrier culture and micro carrier culture.
- ✔ The disposable bio-reaction bag is an enclosed system that could minimize the risk of cell contamination.
- ✔ Process monitoring: The key culture parameters (Swing speed, Angle, Temperature, DO, pH, perfusion rate, CO₂ concentration, weight, pressure, etc.) could be precisely controlled by PID and tracked.
- ✔ Two monitoring model applicable, CO₂ concentration control model suitable for basic disposable bag, and pH/DO control model suitable for pH/DO applied disposable bag.
- ✔ Suitable for use in a regulatory environment and complies with requirements and standards of cGMP.
- ✔ Optional parts like pH/DO sensor module, biomass on-line monitoring module and perfusion module.
- ✔ The optional remote monitoring of culture situation within the equipment can be monitored in real time through the mobile phone, message and E-mail, and the real-time alarm information and parameter information can also be checked.
- ✔ Communication protocol and SCADA system docking are available.

Series of CES



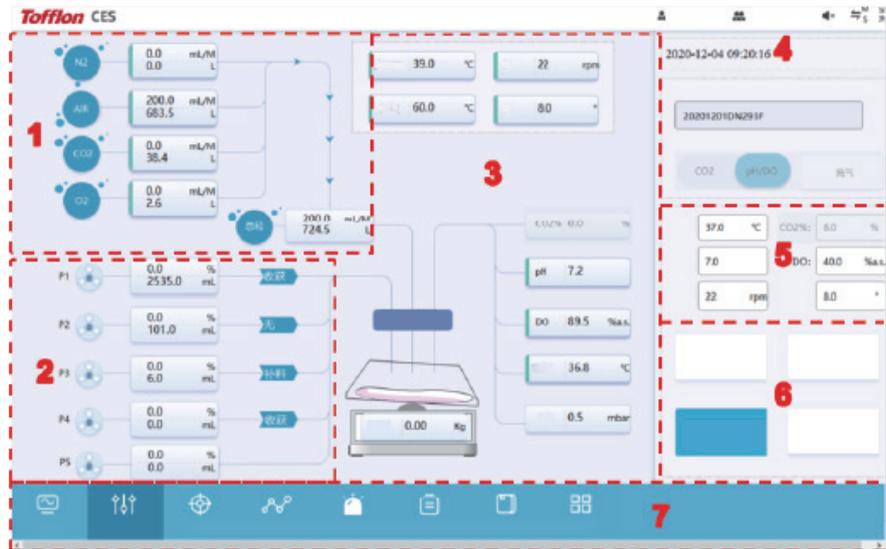
Superiority of CES

- ✓ Fully enclosed system, avoiding open access operation.
- ✓ Disposable biological bag ensures flexible switching between products and avoids cross-contamination risk.
- ✓ Wave type mixing, better gas exchange and lower shear force.
- ✓ Usable for amplification culture process and parallel culture process.
- ✓ Sensors, software and disposable bags are optional and customizable.

Application of CES

- ✓ Immune cell therapy (CAR-T, primary T-lymphocytes, etc.)
- ✓ Stem cell preparation (cord blood stem cells, embryonic stem cells, etc.)
- ✓ Preparation of antibody drugs (PD-1, PDL-1, etc.)
- ✓ Preparation of recombinant protein products (recombinant coagulation factor, EPO, TPO, etc.)
- ✓ Preparation of viral vectors (ADV, oncolytic virus, etc.)
- ✓ Vaccine preparation (ADV vaccine, mRNA vaccine, etc.)
- ✓ Laboratory process development and exploration

CES HMI



PFD in main interface

1. Gas control area
2. Liquid control area
3. Parameter display
4. Permissions and batches
5. Parameter setting
6. Process buttons
7. Work field

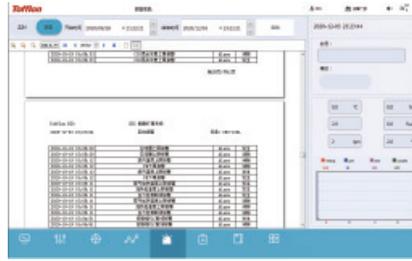
CES control specifications

- ✓ Precise control of temperature through PID and ensure the temperature stability.
- ✓ According to different process requirements, set the corresponding speed and angle in the range. Let the cells in the best dynamic environment.
- ✓ pH PID control through the associated CO₂ gas and feeding alkali association control strategy.
- ✓ DO PID control with air, N₂, O₂, swing speed and angle association control strategy.
- ✓ Ventilation process is through MFC precise control.
- ✓ Temperature PID control to ensure the stable of culture temperature.
- ✓ Feeding control with peristaltic pump and optional for multiple feeding modes such as setting volume feeding, continuous feeding, interval feeding, the feeding rate and time can be set according to the process requirements.
- ✓ Exhaust gas heating to avoid condensate in the exhaust filter, ensure the timely removal of exhaust gas, avoid the adverse effects of waste gas on cells, and ensure the bag to maintain stable pressure.
- ✓ Pressure control by pressure detection function and pressure monitoring function, pressure detection can be used for the integrity of the bag.
- ✓ Pressure monitoring function to ensure the safety of bag pressure during the culture process and avoid the bag defects.
- ✓ Weighing control can ensure the weight of feeding liquid and meet the requirements of perfusion culture process.

CES HMI



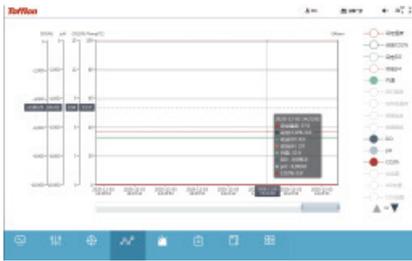
CES HMI



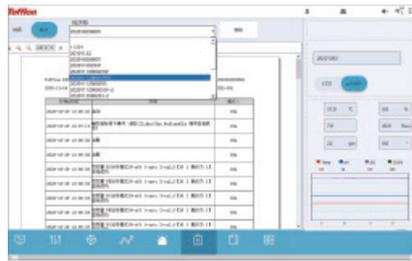
Alarm



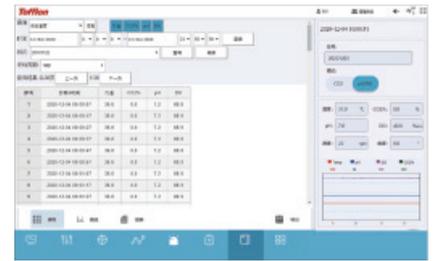
Setting



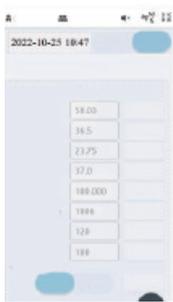
Trend



Log



Report



Calibration

Soft features of CES

- ✓ Provide fully automatic operation and complete data record, in accordance with the requirements of 21CFR Part11.
- ✓ Communication protocol and SCADA system docking are available.

Disposable bag

Five-layer biopharmaceutical Film

- ✓ Thickness: 0.325mm
 - ✓ Liquid contact layer: ULDPE (ultra-low density polyethylene)
 - ✓ Low precipitation/dissolution
 - ✓ No Ingredients of Animal Origin (ADCF)
- LLDPE: high strength, qualified physical performance, puncture proof
 EVOH: water and air blocking layer
 Tie: bonding layer, providing toughness
 ULDPE: excellent chemical compatibility and biological compatibility

LLDPE

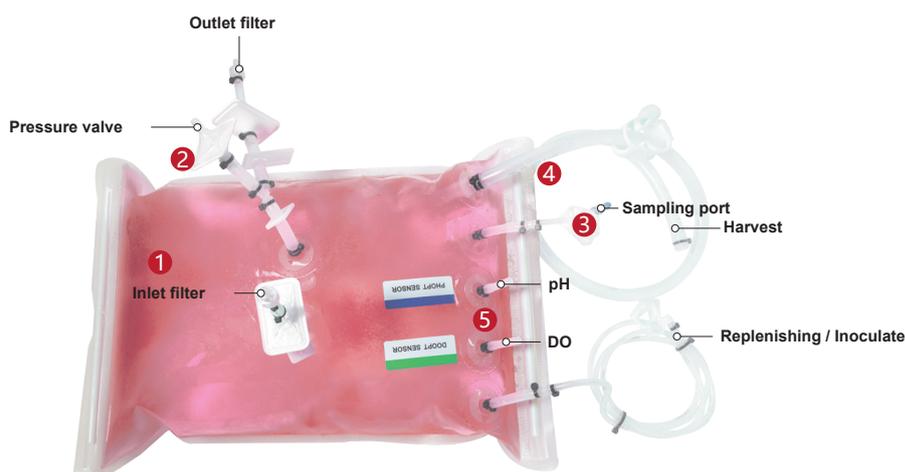
Tie

EVOH

Tie

ULDPE

Disable suspension culture bag



NO.	Items	Description
1	Inlet filter	aperture 0.22μm hydrophobic filter, ensure the effective filtration of inlet particles, reduce the risk contamination
2	Pressure valve	keep the pressure in the bag to maintain a balanced state
3	Sampling port	convenient for sterile syringe sampling by applying lure port
4	Tubes	according to different process accomplish the corresponding pipeline and tube material, like C-Flex tube, silicone tube
5	pH/DO sensors	detecting pH and DO value with optical fiber sensors
6	Perfusion module	used for improving cell density (suspension culture bag)

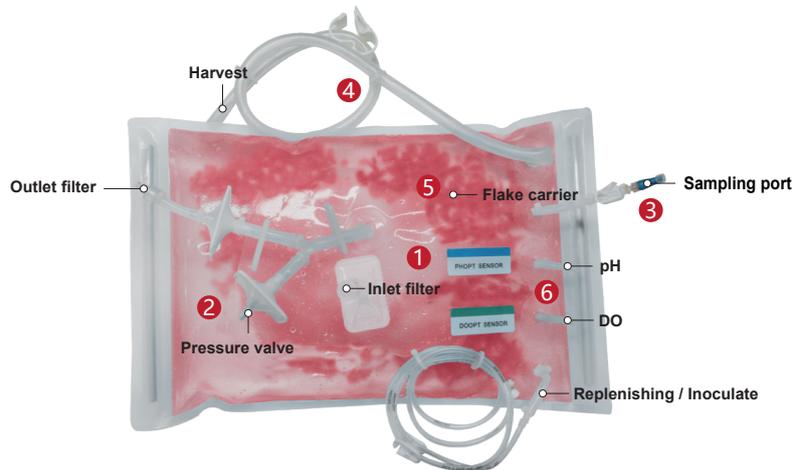
Suspension culture bag

Equipment model	CES-10L				CES-25L	CES-50L	CES-100L	CES-200L
Bag model	1L	2L	5L	10L	20L	50L	100L	200L
Working volume	0.1-0.5L	0.2-1L	0.5-2.5L	1-5L	1-10L	5-30L	10-50L	20-100L
Basic	●	●	●	●	●	●	●	●
With pH/DO sensors		●	●	●	●	●	●	●
With perfusion module		●	●	●	●	●	●	●

Note: ● represents the optional proposals. The default is basic bag.

Disposable flake carrier culture bag

The flake carrier culture bag can be used directly by pre-loading the flake carrier and pre-sterilization. The flake carrier suspension culture solves the problem that the adherent cell culture cannot be produced in large scale.



NO.	Items	Description
1	Inlet filter	aperture 0.22μm hydrophobic filter, ensure the effective filtration of inlet particles, reduce the risk contamination
2	Pressure valve	keep the pressure in the bag to maintain a balanced state
3	Sampling port	convenient for sterile syringe sampling by applying lure port
4	Tubes	according to different process accomplish the corresponding pipeline and tube material, like C-Flex tube, silicone tube
5	Flake carrier	pre-loading the flake carrier and pre-sterilization
6	pH/DO sensors	detecting pH and DO value with optical fiber sensors

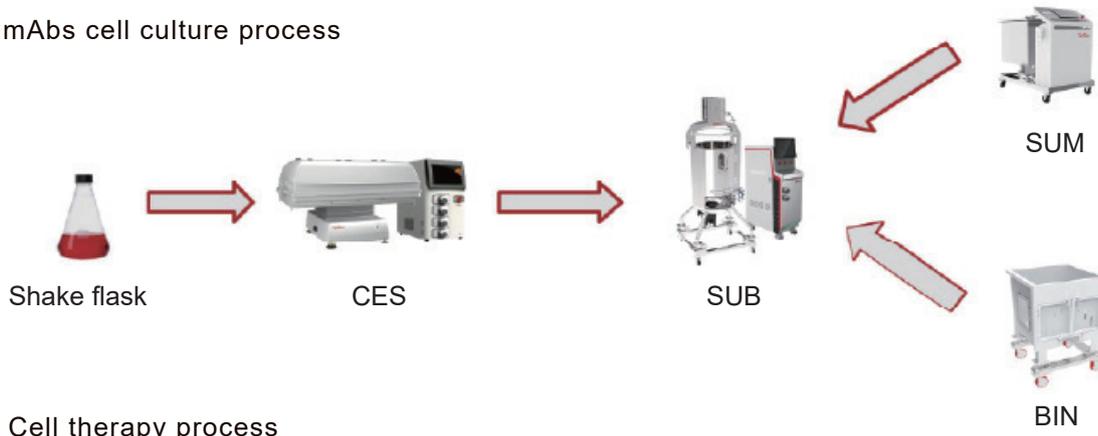
Flake carrier culture bag							
Equipment model	CES-10L			CES-25L	CES-50L	CES-100L	CES-200L
Bag model	2L	5L	10L	20L	50L	100L	200L
Working volume	1L	2.5L	5L	10L	30L	50L	100L
Carrier	30g	75g	150g	300g	1050g	1500g	3000g
Adherence area	36000cm ²	90000cm ²	180000cm ²	360000cm ²	1260000cm ²	1800000cm ²	3600000cm ²
Note: Carrier quantity and surface area: 30g/L Carrier surface area: 12000-1500cm ²							

Disable bag feature

- ✔ Multilayer biopharmaceutical membrane with good biocompatibility
- ✔ 100% integrity test and gamma radiation to guarantee sterility
- ✔ Customizable integrated pH, DO and other sensors enable complex process control
- ✔ Product functions can be customized according to customer needs, perfusion or flake carrier

Technical process

mAbs cell culture process



Cell therapy process

Holistic Approach of Cell Therapy Platform



Technical parameter

Model	CES10L	CES25L	CES50L	CES100L	CES200L
General					
Working capacity	5L	10L	25L	50L	100L
Minimum working volume	200mL	1L	5L	10L	20L
Size of the plate	520*660*580	790*605*665	1100*810*703	1200*910*705	2140*1230*1140
Weight of the plate	35kg	45kg	50kg	95kg	300kg
Size of the controller	390*520*650				NO
Weight of the controller	40kg				
Swing speed rang	1-42rpm	1-42rpm	1-42rpm	1-30rpm	1-25rpm
Angle rang	2-12°	2-12°	2-12°	2-12°	1-9°
Temperature control					
Type of the sensor	pt100				
Sensor grade	Grade A				
Rated power of the bag	250W/220V*1	400W/220V*1	550W/220V*1	650W/220V*1	750W/220V*2
Temperature control range of the bag	Room temperature to 40°C				
Temperature control accuracy of the bag	±0.2°C				
Rated power of the exhaust	15W/24DC*1				15W/24DC*2
Temperature control range of the exhaust	45~55°C				
Weigh control					
Weigh control rang	0-5kg	0-10kg	0-25kg	0-50kg	0-100kg
Weigh control accuracy	0.05 + weighted * 0.5%				
pH/DO control					
pH control range	5.5-8.5				
pH control accuracy	±0.1pH				
DO control range	0-100%				
DO control accuracy	±3%				
Pressure control					
Pressure control range	0-30mbr				
Pressure control accuracy	1%				
Gas control					
MFC	Default setting, air*1, O2*1, CO2*1, optional N2*1				
Accuracy of MFC	1%FS				
Fast filling	0-5L/min				0-10L/min
CO ₂ concentration control range	0-15%				
CO ₂ concentration control accuracy	when CO ₂ concentration 5%				
Peristaltic pump					
Tube ID & thickness 1.6mm	rpm				
	No.	(mL/rev)	5rpm	100rpm	400rpm
0.8	13#	0.04	0.2	4.3	17
1.6	14#	0.14	0.7	14	56
2.4	19#	0.29	1.45	29	115
3.2	16#	0.47	2.35	47.5	190
4.8	25#	0.85	4.25	85	340
313 type peristaltic pump					
Tube ID & thickness 1.6mm	rpm				
	No.	(mL/rev)	5rpm	100rpm	400rpm
1.6	14#	0.26	1.30	26	104
3.2	19#	1	5.00	100	400
4.8	16#	2.2	11.00	220	880
6.4	17#	3.5	17.50	350	1400
8.0	18#	5	25.00	500	2000



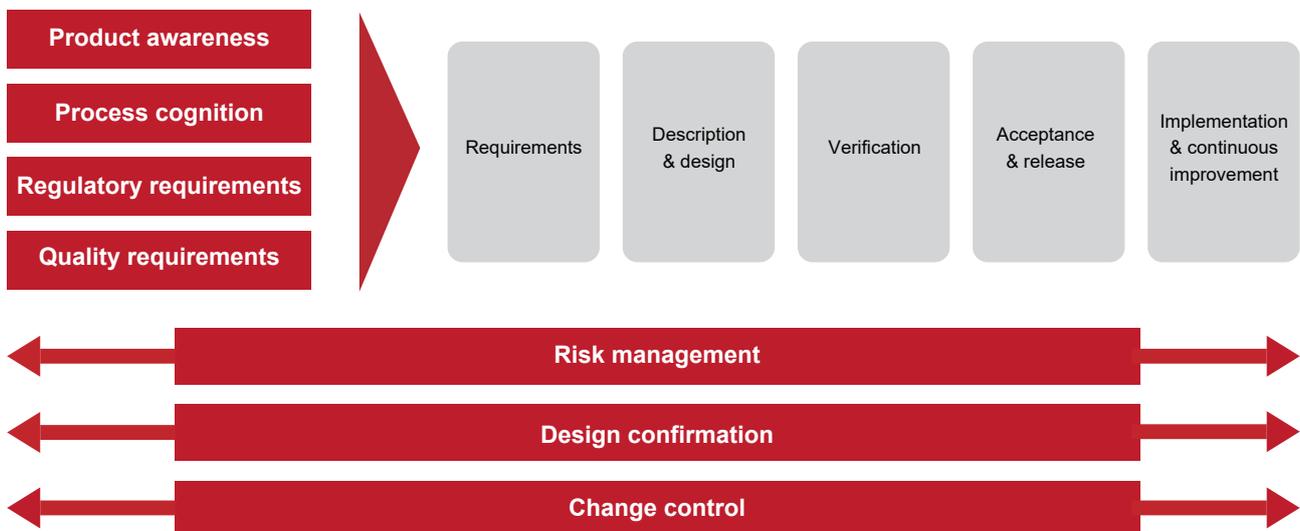
Project Management

Three main factors determine the success of the project. Our organizational mode has been making constant update and improvement to enable you to fully achieve these goals. Through cooperation with us, you can minimize the direct resources required to manage the selection, purchase, installation, startup and verification of new production equipment.



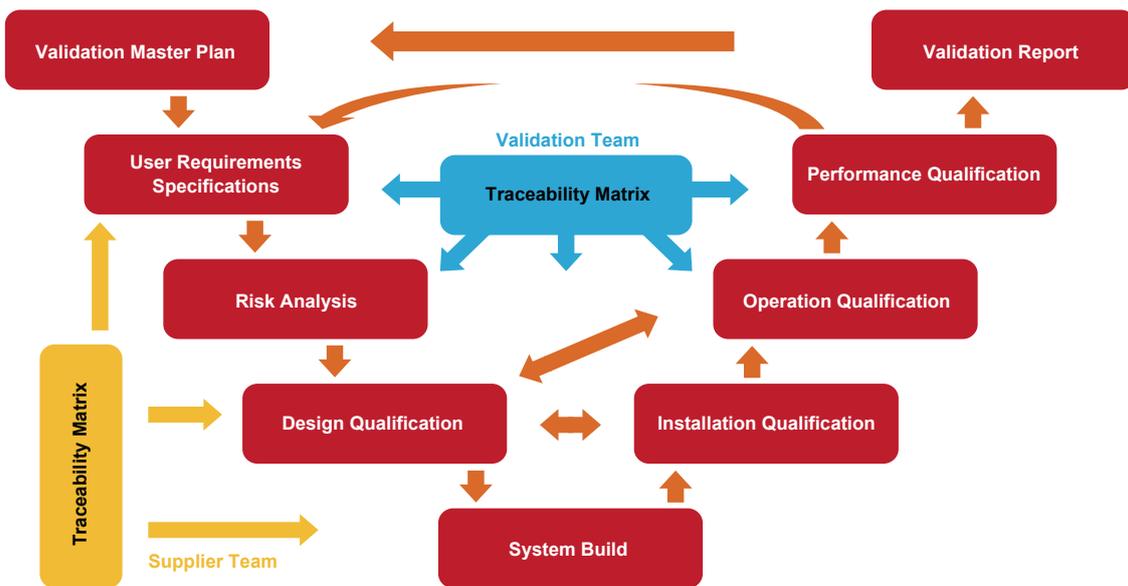
- ✔ Reliable quality
- ✔ Short cycle
- ✔ Focus on cost

Good Engineering Practice - GEP





Validation Support



Verification Document System

- ✔ Complete document system
- ✔ Strict quality guarantee process
- ✔ Comply with cGMP confirmation scheme
- ✔ Ensure the stability and reliability of product quality





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