pci PHARMA SERVICES

Excellence in Manufacturing Services

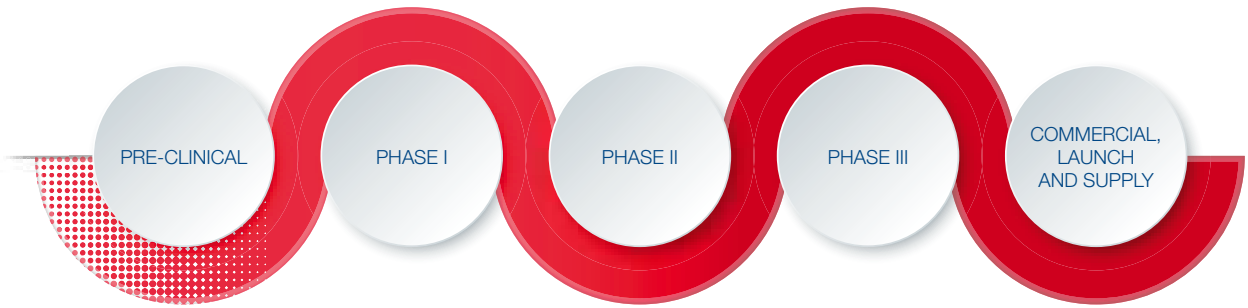
pci MANUFACTURING SERVICES

EXCELLENCE IN PHARMACEUTICAL OUTSOURCING FROM MOLECULE TO MARKET

pci PHARMA SERVICES

Excellence in Pharmaceutical Outsourcing from Molecule to Market

As a respected industry leader and trusted partner we provide a comprehensive range of outsourced pharmaceutical services that stretches all the way from early stage development to long-term commercial supply. This reputation is based on best-in-class technologies, cutting-edge research, an exceptional team of outstanding people and a consistent record of meeting the highest regulatory and quality standards. Equally important is our commitment to an exceptional customer experience and we share our customers' passion for supplying lifesaving medicines to patients around the world. We're committed to meeting their evolving needs by leveraging our experience and expertise to develop the best possible solutions to their drug development challenges.



pci MANUFACTURING SERVICES

pci CLINICAL SERVICES

pci COMMERCIAL PACKAGING

PCI's Molecule to Market Service

PCI's integrated and comprehensive service offering takes you through every step of the product lifecycle and is committed to providing the leading customer experience from molecule to market.

PRE-CLINICAL

- Formulation Development
- Analytical development/ characterization

PHASE I

- Formulation development
- Analytical development
- Drug in capsule/ vial technology (Xcelodose®)
- Phase I product manufacture
- Tablets/capsules
- Blinding via over-encapsulation
- Phase I packaging and labeling
- Package design and development
- Storage and distribution

PHASE II

- Formulation optimization
- Dosage form process validation
- Analytical testing and stability services
- Phase II product manufacture
- Tablets/capsules
- Blinding via over-encapsulation
- Phase II packaging and labeling
- Package design and development
- Storage and distribution

PHASE III

- Comparator sourcing
- Scale-up studies
- Phase III product manufacture
- Tablets/capsules
- Blinding via over-encapsulation
- Phase III packaging and labeling
- Analytical testing and stability services
- Package design and development
- Storage and distribution

COMMERCIAL, LAUNCH AND SUPPLY

- Scale-up for commercial supply
- Commercial product manufacture
- Commercial packaging and labeling
- Validation services
- Analytical testing and stability services
- Product release-to-market and launch expertise
- Package design and development
- Serialization
- Storage and distribution

A Full Service Solution for Investigational and Commercial Highly Potent Drug Products

Through the acquisition of Penn Pharma, PCI has significant experience in providing integrated drug development, clinical trial supply and commercial manufacturing of solid dose, liquid and semi-solid potent products to high standards of safety and quality.

Development and Manufacturing of Highly Potent Drug Products - A Center of Excellence

The pharmaceutical landscape continues to evolve with growth in specialized medicines especially in oncology development. Significant investment in a specialized contained manufacturing facility resulted in PCI being awarded ISPE Facility of the Year 2014. Additional investment includes both contained roller compaction and fully contained Xcelodose® 600S technology, further driving PCI's market leading position.

Pharmaceutical Development

Our comprehensive service offering includes early stage formulation and analytical development, API capsule and vial filling using Xcelodose® technology, small-scale batch manufacturing, scale-up, stability testing, process validation, and technology transfer with associated analytical support services.

Our strength lies in the integrated nature of our services, combining formulation and analytical development with clinical trial supplies.

By involving our experts early in the strategic development of your new product, we assist in process optimization, minimize regulatory hurdles and ensure the most efficient routes to clinic are delivered for potent and non-potent drug products.
We offer formulation development services for a variety of dosage forms including:

- Tablets, capsules and powders
- Gels and creams
- Liquids, solutions, suspensions and emulsions
- Suppositories and pessaries
- Granules for reconstitution
- Drug in capsule/vial.

Additional areas of expertise in pharmaceutical development include:

- Excipient compatability
- Development of modified release dosing
- Soluability enhancing technologies
- Orally dispersible dosing.

Clinical Trial Supplies

PCI offers a broad range of technologies and equipment to address manufacturing and packaging needs at each stage of clinical development. Central to PCI's service offering is our capability to manufacture a range of dosage forms containing highly potent molecules in compliance with current GMP standards.

For over 35 years we have been successfully manufacturing pharmaceutical dosage forms for our global client base. Our strength lies in the integrated nature of our services, combining formulation development and analytical services with clinical trial manufacturing for both potent and non-potent molecules. This comprehensive yet flexible solution is delivered with close coordination of each stage of the development process by our experienced project management team.

Our facilities are approved by multiple regulatory bodies for the manufacture of investigational and commercial products with flexibility in processing technology. From a handful of capsules for first in-man studies to hundreds of kilograms of tablets, we have the technology and capacity to satisfy your clinical trial needs whatever the phase of development.

Expertise in development packaging completes a full service solution for clinical trial supplies.

By combining formulation and analytical testing with GMP clinical trial manufacturing and packaging, we are able to offer a seamless service throughout your development journey.

Potent and non-potent clinical supplies include:

- Small-scale < 1kg batches
- Drug-in-capsule
- Large-scale batches
  – fully contained to 120kg
  – 300kg processing technology.

Recent investments in both contained roller compaction and fully contained Xcelodose® 600S technology demonstrates our continued commitment to delivering best in class solutions for potent molecules.

Utilizing our leading-edge facilities and equipment, PCI offers unrivaled capabilities in the production of multiple dosage forms containing highly potent active pharmaceutical ingredients for both investigational and commercial use.

Commercial Manufacturing and Packaging

PCI offers flexible and globally compliant commercial scale manufacturing and packaging of tablets, capsules, semi-solid and oral liquid preparations. Investments include separate suites for large volume tablet manufacture and serialization of drug product packs. Our aim is to provide a comprehensive service for launch and ongoing commercial supply using an experienced team of production, engineering and validation specialists.

Dispensing

Depending upon the hazard profile of the active pharmaceutical ingredient, PCI will utilize a number of on-site dispensing facilities including high-performance isolators for the weighing of highly potent actives.

Granulation

From 10L to 600L processors, PCI is able to granulate and dry across a broad range of batch sizes to match the majority of commercial demands. Using HMI interfaced high shear mixer granulators and fluid bed driers, PCI is confident of producing reproducible, globally compliant commercial batches of granules for compression or encapsulation.

PCI's dry granulation capability utilizing roller compaction provides semi-continuous robust granulation for moisture or heat sensitive molecules.

Tablets

With multiple machines available to compress up to 200,000 tablets per hour, PCI maintains flexibility and capacity to compress a broad range of tablets from simple normal curvature to complex embossed shapes including mini tabs.

PCI scientists utilize instrumented tablet presses to collect batch data to supporting validation and routine production. The team are highly experienced in the transfer of existing processes into our GMP compliant facilities.

Capsules

With several machine types on-hand capable of a broad range of output speeds, PCI has the technology and capacity to meet your commercial capsule demands.

Covering all the major capsule sizes, PCI is able to encapsulate moisture sensitive formulations, modified

release multiple particulates as well as formulations for inhalation devices.

PCI has both on-machine and off-line capsule weight checking equipment to provide a high level of confidence in the compliance of the finished batch.

Coating

Utilizing aqueous based film coating systems, PCI maintains a number of perforated pan coating machines to provide a range of batch sizes for coated tablets up to a scale of 350kg.

PCI has invested in the latest HMI interfaced coating machines with high performance spray systems that produces an exceptional quality of coated tablets. PCI specifies clean-in-place systems on all new equipment including coating machines.

Our latest generation coating machines are capable of handling tablet cores containing potent actives, configured with contained core loading and sample collection ports.

Semi-solids and Liquid Oral Preparations

PCI is experienced in manufacturing semi-solids and oral liquids for commercial supply. With excellent scale-up technology in-house, commercial batch production ranges from 5L to 500L.

Several high-performance processors with heated jackets, vacuum and in-line homogenization are available to provide quality formulations for tube and bottle filling.

On-site analytical and micro-biological laboratories support production of all oral preparations.

Process	Technology	Suppliers	Batch scale range
Granulation	High shear Fluidized bed Roller compaction	GEA GEA Gerteis	1kg to 50kg 1kg to 50kg 10g per trial to 100kg/hr
Drying	Single vessel processor Fluidized bed	Zanchetta, Collette GEA	5kg to 150kg 1kg to 50kg
Encapsulation	Dosating pin Sliding gate	IMA Bosch	100g to 350kg 1kg to 120kg
Compression	Rotary Contained	Riva, Manesty Courtoy	100g to 350kg 1kg to 120kg
Coating	Perforated pan	Manesty O'Hara	1kg to 50kg 1kg to 350kg

Contained Manufacturing, A Center of Excellence - Speed to Market

PCI is able to demonstrate a long and successful track record in the development and manufacture of products requiring containment resources. Our facilities and capability for handling potent products enables the safe development, clinical and commercial supply of products with an OEL as low as 0.01µg/m^3 (eight hour time weighted average).

Investment in leading-edge contained engineering technology places us at the forefront of the industry and enables the provision of a fully comprehensive service for the development and manufacture of drug product containing highly potent molecules. Our 1-10kg development facility utiilizes processing technologies including roller compaction, high shear granulation and fluid bed drying that are common with our larger-scale production unit.

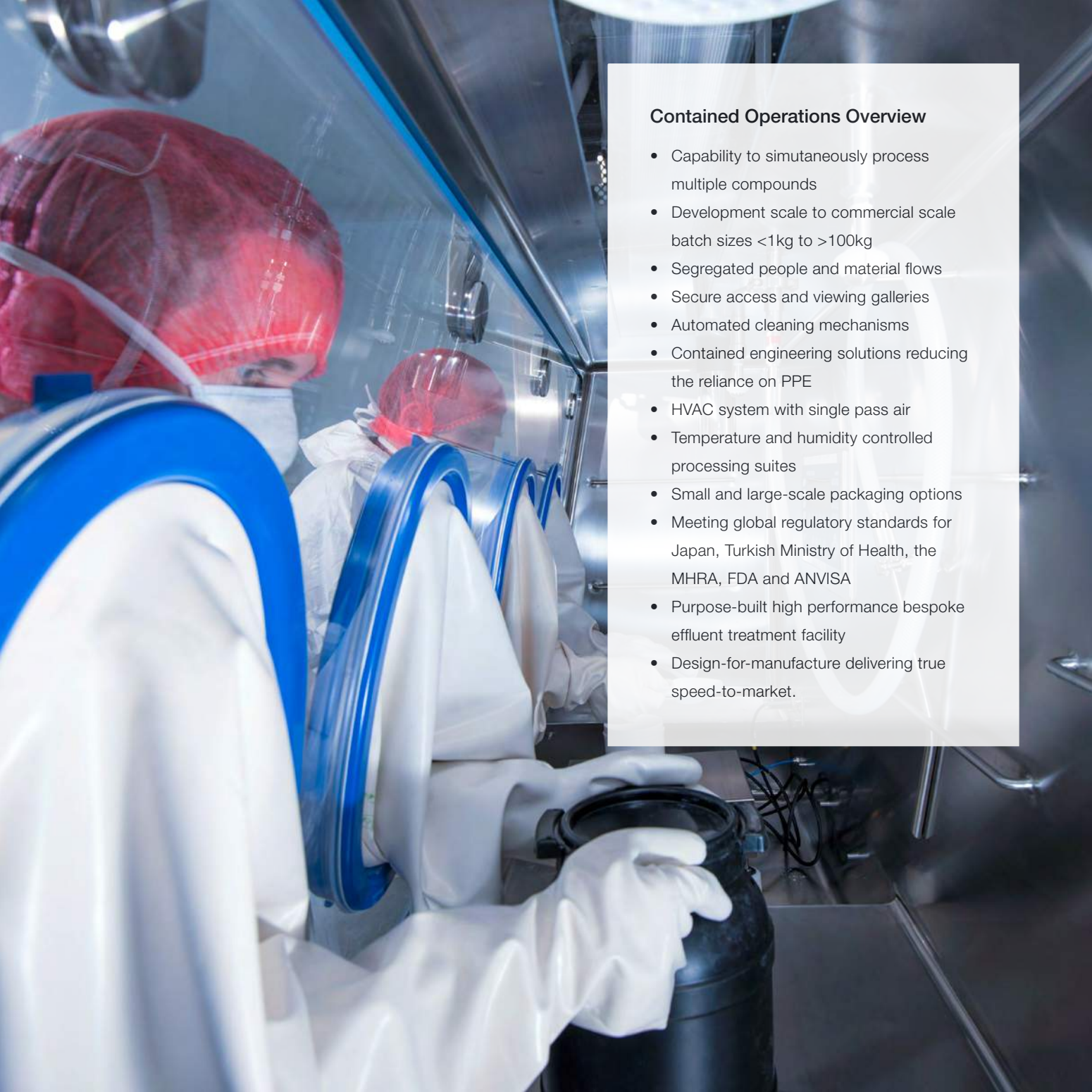
Our fully integrated facility utilizes common equipment trains from development to commercial scale optimizing scale-up and delivering the shortest timelines from early stage development to commercial launch. Recognized for our regulatory and export experience, PCI supplies many markets including Europe, the USA, Japan and South America with an exemplary regulatory record.

Our philosophy is to maintain a flexible, responsive and reliable service. Our development and commercial suites together create a potent “molecule to market” zone with geometric scale-up delivering reproducibility and speed-to-market.

Purpose Built Facility

PCI’s purpose-built, award-winning facility meets the highest international quality standards. At all stages of the process the facility is designed to fully contain the active ingredients minimizing operator exposure and limiting the need for protective clothing.

Dispensing of API is undertaken within isolators and subsequent processes within appropriately contained equipment ensuring operator safety and preventing cross contamination. The facility has multiple levels of containment built into the design delivering health and safety and GMP requirements.



Contained Operations Overview

- Capability to simutaneously process multiple compounds
- Development scale to commercial scale batch sizes <1kg to >100kg
- Segregated people and material flows
- Secure access and viewing galleries
- Automated cleaning mechanisms
- Contained engineering solutions reducing the reliance on PPE
- HVAC system with single pass air
- Temperature and humidity controlled processing suites
- Small and large-scale packaging options
- Meeting global regulatory standards for Japan, Turkish Ministry of Health, the MHRA, FDA and ANVISA
- Purpose-built high performance bespoke effluent treatment facility
- Design-for-manufacture delivering true speed-to-market.


GEA
GEA Pharma Systems

Contained Processes

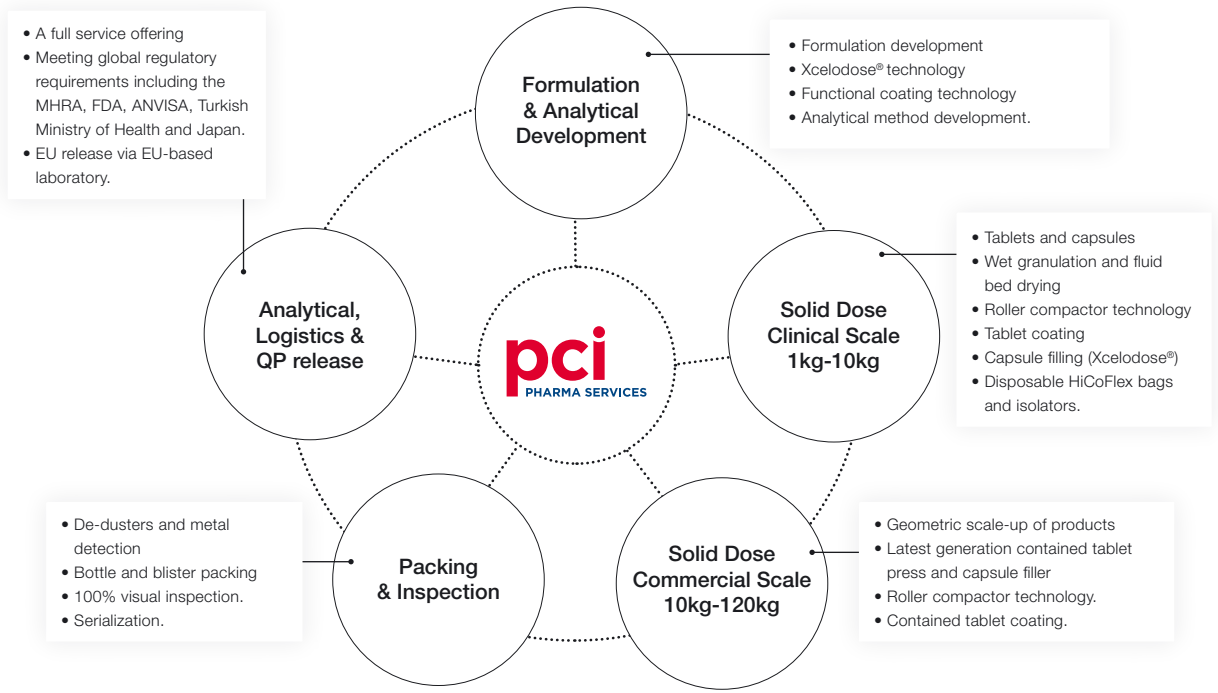
PCI's award winning contained manufacturing facility ensures reliable quality and delivery performance, providing an innovative and agile relationship with our clients.

Continued investment maintains our leading position in the processing of highly potent molecules. In addition to existing contained equipment, further investments include a Gerteis Mini-Pactor and a fully contained Xcelodose® 600S technology delivering a faster and cost effective route to clinic.

Key capabilities and technologies include:

- OEL down to 0.01µg/m^3
- High shear mix granulator
- Contained roller compaction
- Contained Xcelodose® 600S technology
- Fluid bed drier
- Cone mill
- Blending mixer
- Tablet presses
- Tablet coaters
- Capsule filling
- Bottle and blister packaging.

Our Contained Service Cycle



Contained Roller Compaction

Roller compaction is a proven process that provides a method of granulation for materials that are heat and moisture sensitive. The process avoids the use of granulation liquids and high temperatures associated with wet granulation and subsequent drying methods.

Roller compaction turns powder blends into densified sheets using the pressure of two compacting rollers. The resulting sheets can then be milled to any desired mesh size providing an efficient and scalable process. PCI has invested in contained Gerteis Mini-Pactor technology to further expand our contained manufacturing operations. This technology offers a patented proven design able to process highly potent molecules using effective containment technology and integrated cleaning systems.

Our investment in the Gerteis Mini-Pactor allows easy scale-up to commercial volumes, with an output range from 10g/trial to 100kg/hour, facilitating shorter and less costly development programs. The addition of this state-of-the-art technology to our already award-winning contained operations, ensures that PCI is able to offer the full range of processing options for the development and manufacture of highly potent molecules.

Contained Xcelodose® Technology

Faster Times to First-in-Man

By delivering drug directly into capsules or vials, Xcelodose® removes the need for initial formulation development and the associated stability testing delivering faster times to first-in-man studies.

The fully programmable system provides exceptional levels of accuracy and precision, waste of drug substance is minimized and batch records allow traceability of individual capsules that meet GMP requirements.

Contained Xcelodose® Technology for Potent Molecules

As the biological activity and the specificity of APIs increase dosage strengths are decreasing leading to APIs becoming more potent in nature.

To complement the Xcelodose® technology, additional investment in containment solutions ensures that PCI is able to support customer demand for the early stage development of highly potent molecules.

PCI's latest investment in Xcelohood™ and Xceloprotect™ technology provides contained Xcelodose® solutions, ensuring safety by preventing operator exposure.

The high levels of containment provides an Occupational Exposure Limit (OEL) as low as 0.1µg/m^3 over an eight-hour time weighted average meeting Safebridge 3 and 4 categorizations.

Xcelodose® 120

Xcelodose® was first introduced at PCI's Tredegar facility in 2010 with the installation of the Xcelodose® 120, a semi-automated technology requiring manual separation of the capsules before loading into the dial plate. Filling is automatic and acceptable capsules are then manually capped and closed. This technology is also able to deliver drug in vial capability.

Xcelodose® 600S

PCI's Tredegar site has further invested in the very latest Xcelodose® 600S microdosing system. This new technology has the capability to fill amounts as low as 100 micrograms at speeds of more than 600 capsules an hour, approximately five times faster than filling the capsules by 120. The Xcelodose® 600S is fully automated and is controlled by a programmable logic control (PLC) system.


CAPSUGEL


BOSCH

Contained Manufacturing Support Services

PCI provides a full service to support your needs as a product transitions through its development to commercialization. Through our Center of Excellence for Contained Manufacturing, we offer more than a general contract manufacturer.

We work with specialists to enable classification, development and optimum manufacturing processes providing a turnkey solution for your potent requirements.

Services offered include:

- Formulation development
- Analytical services
- Stability services
- Clinical trial manufacturing
- Clinical trial packaging and labeling
- Commercial manufacturing
- Commercial packaging and serialization services
- Storage and distribution
- QP release service.

One Strategic Partner for all your Outsourcing Needs

Analytical Services

- Analysis of dosage forms, our laboratory provides data to support new drug applications and development dossiers
- Chromatography by HPLC/UPLC
- GC including a range of columns and electrochemical detection
- Dissolution testing using USP I and II apparatus
- Spectroscopic analysis including UV/Vis, Fluorescence and FTIR
- Physical testing including particle size determination
- Microbiological testing
- Stability testing.

Clinical Trial Supply

- Clinical trial manufacture
- Primary packing
- Secondary packing
- Specialist products including biologics and ATMPs
- Logistics
- Comparator sourcing
- Online portal via PCI Webflow™
- PCIFastTrack™ for time critical clinical supplies.

Commercial Packaging Services

- Primary and secondary packaging
- Support of multiple delivery forms
- Multiple customer and product types
- Serialization and anti-counterfeiting solutions
- Packaging development services
- Launch services and global supply.

QP Services

- Experienced QP team
- A minimum of one QP always available for urgent IMP releases
- Undertake familiarization visits to non-EU facilities
- Extensive portfolio of audited sites
- Review and advise on IMPD content.

Storage & Distribution

- MHRA and FDA accredited warehousing with a range of temperature storage including Controlled Room Temperature (CRT) (15-25°C)
- Refrigerated capacity (2-8°C)
- Frozen capacity (-20°C, -40°C, -80°C and -196°C)
- Controlled drug store
- Dedicated clinical supplies distribution team
- Various shipping systems: ambient, controlled ambient, refrigerated and frozen with full temperature monitoring
- Courier services: specialist, standard and next day delivery
- Fully managed returns service.

pci
PHARMA SERVICES

Our dedicated team of specialists will be happy to discuss any of your outsourcing needs.

e : sales@pciservices.com **w : pciservices.com**

NORTH AMERICA

PHILADELPHIA: +1 215 613 3600 | ROCKFORD: +1 815 484 8900 | SAN DIEGO: +1 858 997 1490

EUROPE

HAY-ON-WYE: +44 (0)1497 820829 | TREDEGAR: +44 (0)1495 711222 | BRIDGEND: +44 (0)1656 750550 | DUBLIN: +353 1 841 8300

ASIA PACIFIC

TOKYO: +44 (0)1495 711222 | PORT MELBOURNE: +61 3 9673 1000

REST OF WORLD

TEL AVIV: +972 52 4283224