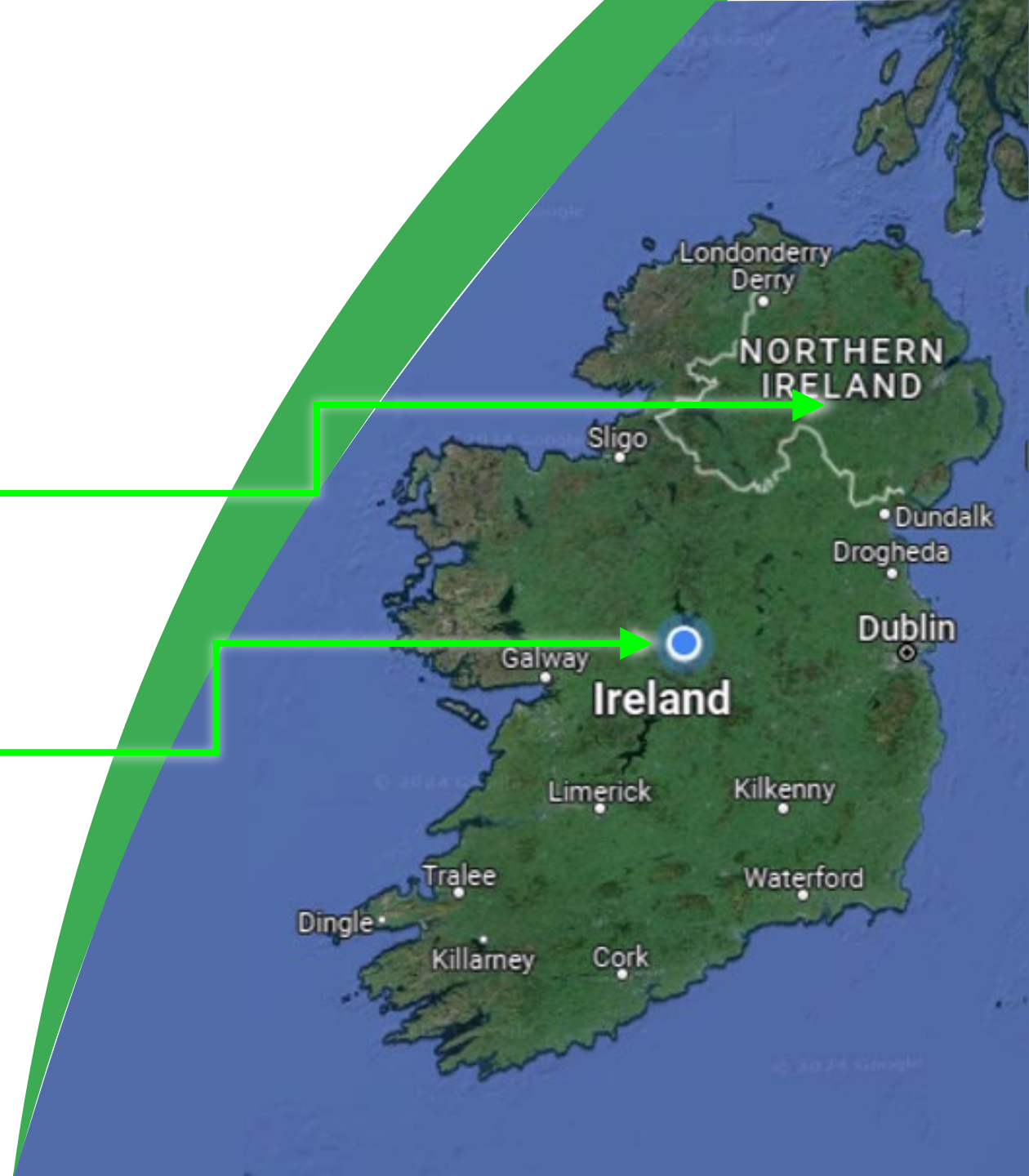


Introduction to Arran

Overview of technologies and
manufacturing capabilities



Location



Arran differentiators

Chemistry experience:

- Over 30 years of experience in handling difficult small molecule chemistry.
- Modular, flexible, adaptable equipment to suit many processes.
- Flexibility to supply kg to 100 tonnes

Quality:

- Routinely audited by top pharma companies.
- EU based manufacturer with REACH compliance experience
- ISO compliant and approved by US FDA Food division.
- Excellent health and safety and environmental standards.
- Registered on over 30 Drug Master Files.

Foundation status



PHARMACEUTICAL
SUPPLY CHAIN INITIATIVE



ISO 50001

ENERGY
MANAGEMENT



ISO 14001

ENVIRONMENTAL
MANAGEMENT



ISO 9001

QUALITY
MANAGEMENT



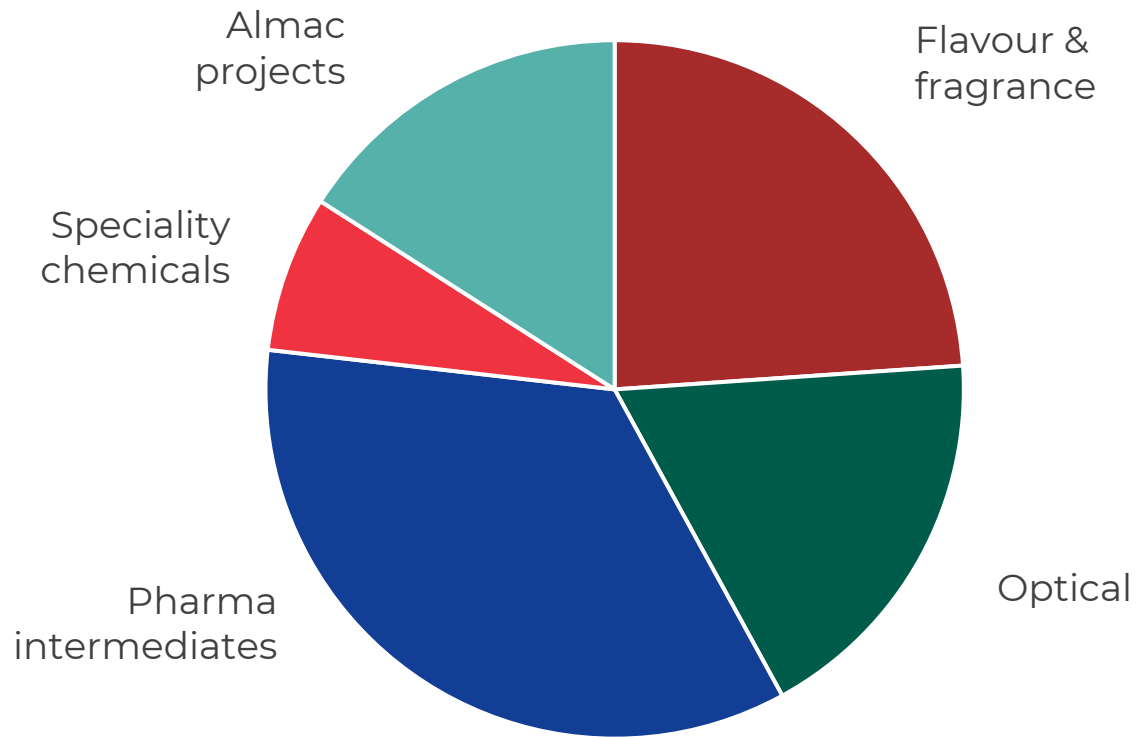
EU REACH
COMPLIANT



AUDITED BY
HUMAN FOODS

Arran client base

Calculated as percent of revenue in
2024-2025 financial year



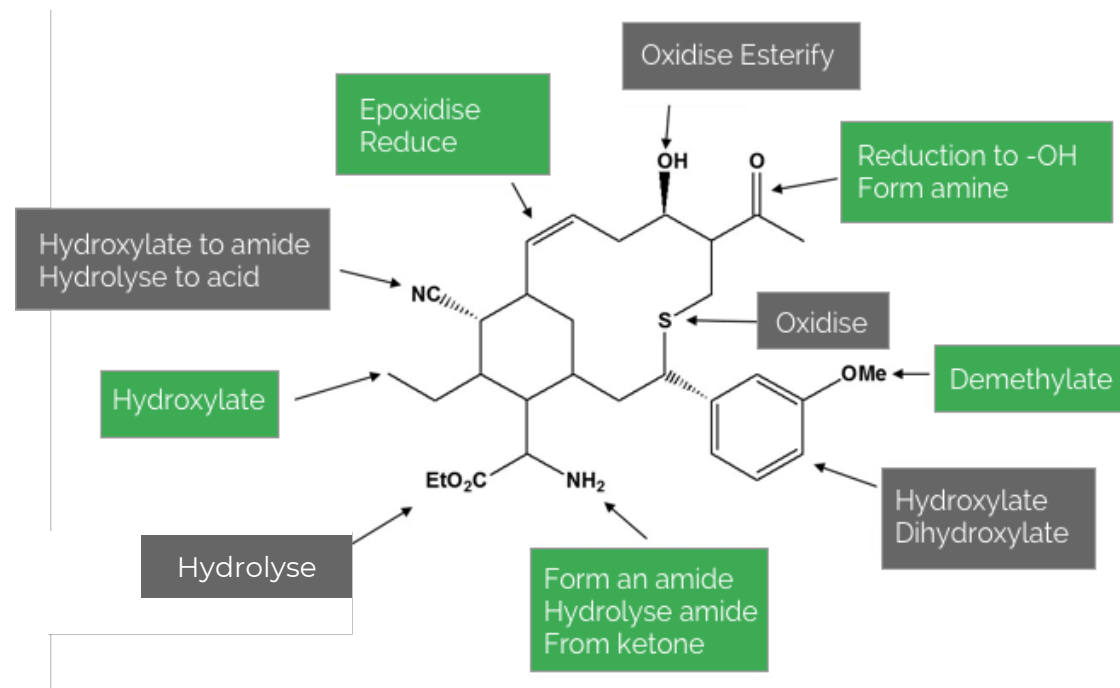
Geography	Revenue
Europe	45%
United States	40%
Asia	10%
Rest of world	5%

Chemistry experience

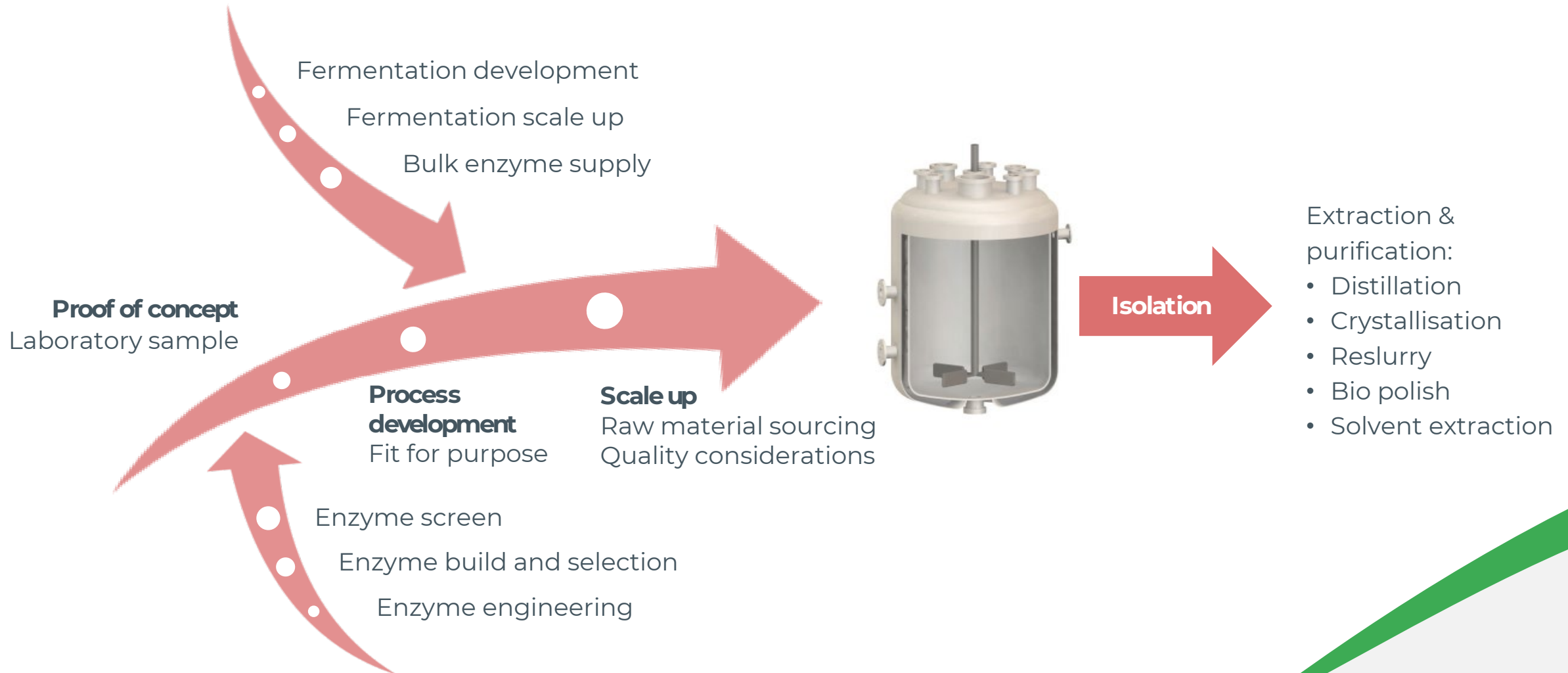
Classical:

Alkylation	Methylations
Aminoalkylation	Michael reaction
Asymmetric synthesis	Optical resolution
Condensations	Organometallic
Dealkylation	Organosilicon
Dieckmann condensation	Oxidation
Diels Alder reaction	Ritter reaction
Grignard reactions	Stereo-selective reactions
Heck reaction	Suspension polymerisation
Leuckart reaction	Flow hydrogenation
Mannich reaction	Transfer hydrogenation

Enzymatic:

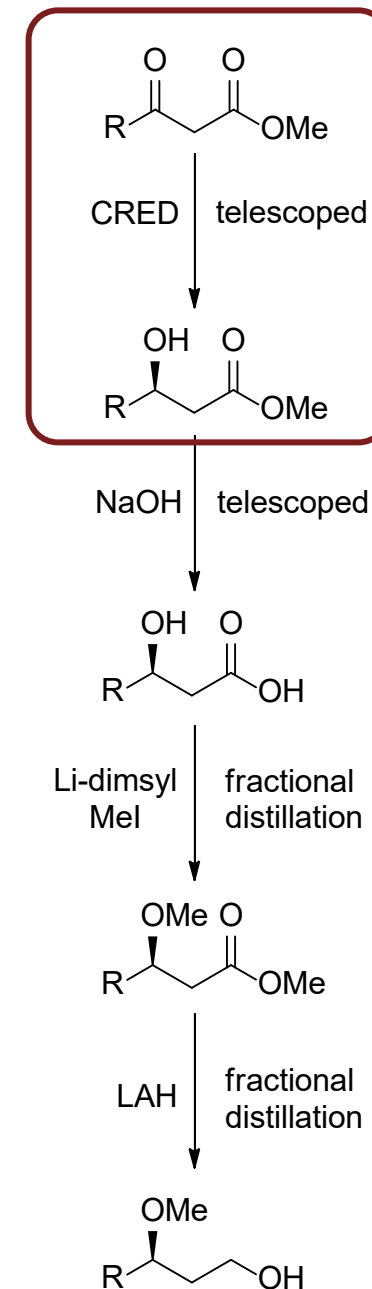
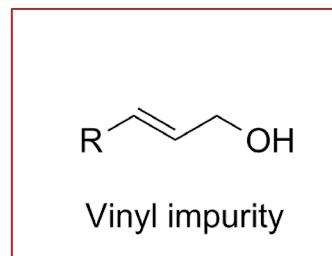
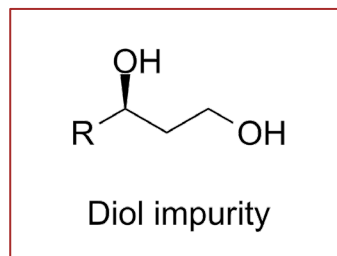


Core technology: Biocatalysis



Case study: RSM manufacture (1 of 2)

- Japanese client requires regulatory starting material for Phase 3 clinical trials.
- Chemocatalysis failed to deliver target specification (99.2%) for enantiomeric excess.
- New synthetic route, process development and multi tonne supply necessary.
- Strategies developed for control of:
 - Diol impurity
 - Vinyl impurity



Case study: RSM manufacture (2 of 2)

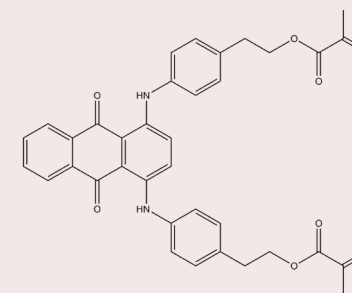
Properties	Specification target	Specification achieved	
Enantiomeric excess	Greater than 99.2%	99.3%	✓
Named impurity (Diol)	No greater than 0.5%	Less than 0.2%	✓
Named impurity (Vinyl)	No greater than 0.5%	Less than 0.15%	✓
Named impurity (BHT)	No greater than 0.5%	Less than 0.2%	✓
Named impurity (Me-BHT)	No greater than 0.5%	Less than 0.2%	✓
Unnamed impurities	No greater than 0.1%	Less than 0.1%	✓



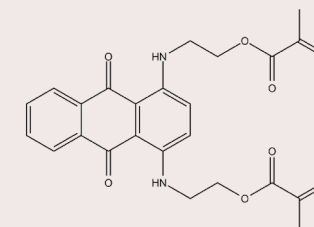
Core technology: Optical production suite

Case study: Products for optical industry

Monomers
UV blockers, Co-polymer
and Reactive Blue dyes

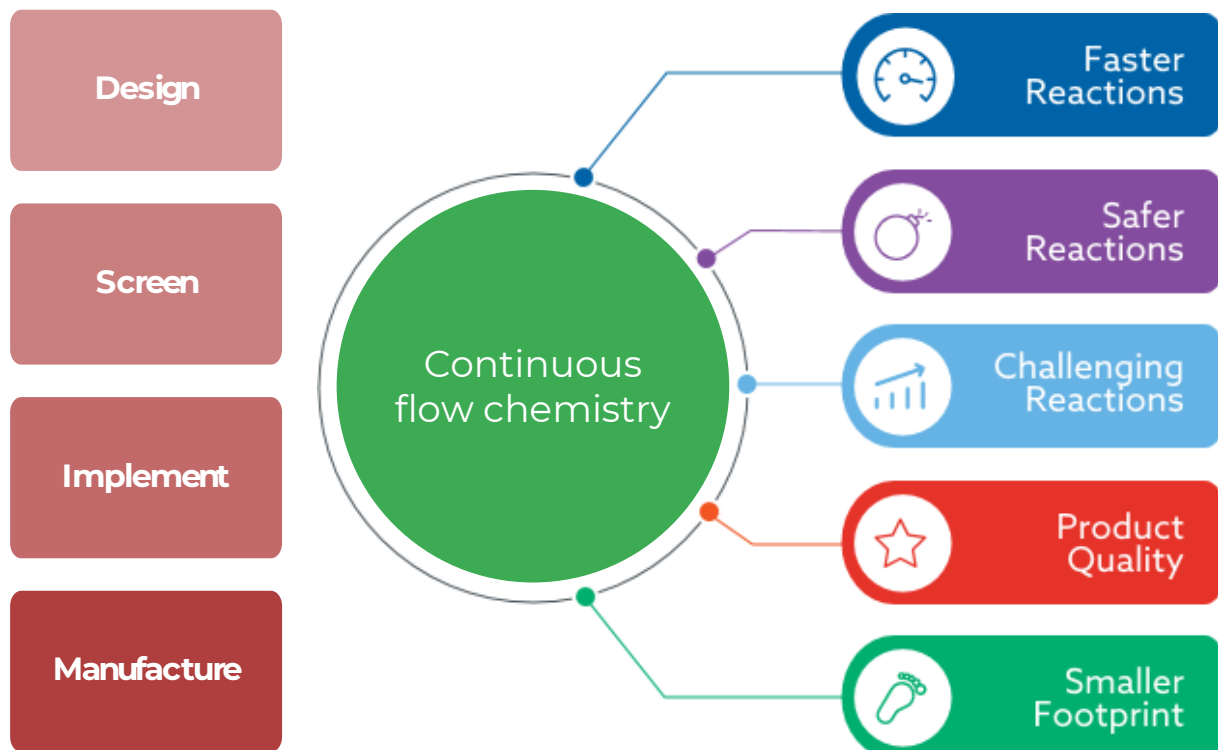


RB246



RB247

Core technology: Flow chemistry



Case study: Price saving from flow hydrogenation

Description	Batch process	Flow process
Mass of substrate to process	117 kg	
Hydrogenation catalyst deployed	Pd on activated carbon	Pd on Al ₂ O ₃ pellets
Loading catalyst	10% weight	1.07% weight
Mass of catalyst	11.7 kg	1.25 kg
Catalyst price contribution (EUR)	€49,217	€5,250

Core technology: Pilot plant



Glass lined

Stainless steel

Hastelloy



Case study: Process optimisation (1 of 2)

Step 1: Alkylation

- Reduction in reactor days
- Reduction in solvent volume
- Elimination of one processing solvent
- Elimination of solvent switch
- Use of HCl (gas) instead of HCl (solution)
- Improved mixing and agitation

Step 2: Boc protection

- Reduction in reactor days
- Reduction of solvent volumes
- Deployment of less expensive processing solvent

Step 3: Cryogenic step

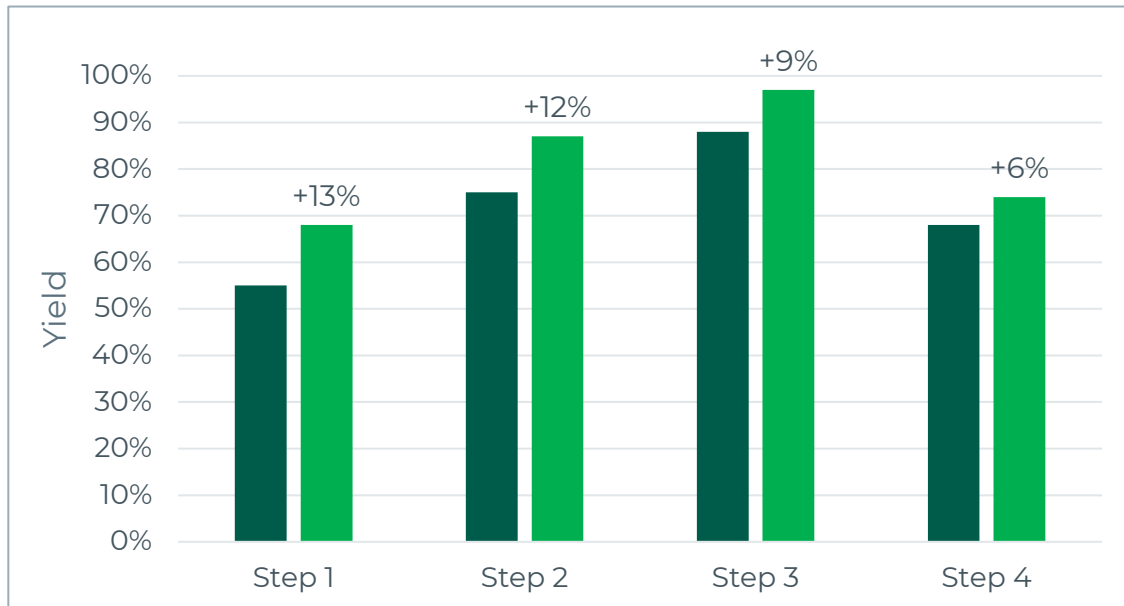
- Reduction in solvent volumes
- Lowered reaction temperature to -25°C
- Incorporated second reactor for quench and work up
- Computer modelling to optimise mixing and reactor fit
- Deployment of less expensive quenching agent
- Replacement of solvent mix (custom to commercially available)

Step 4: Hydrolysis

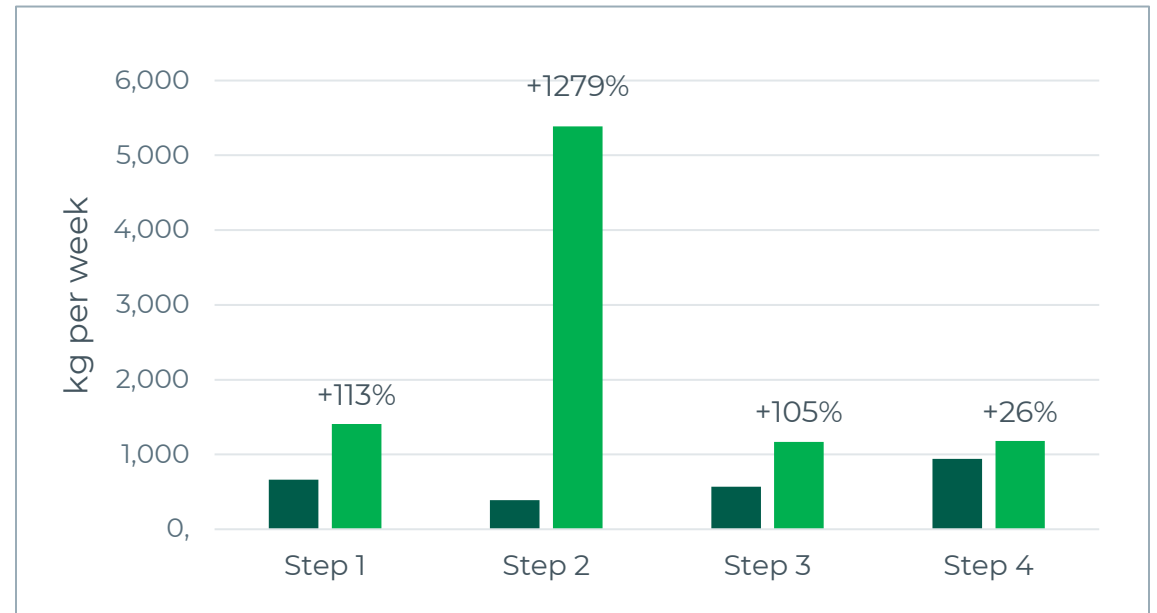
- Reduction in solvent volumes
- Elimination of one processing solvent

Case study: Process optimisation (2 of 2)

Yield



Throughput



Before optimisation

EUR €1,154 per kg

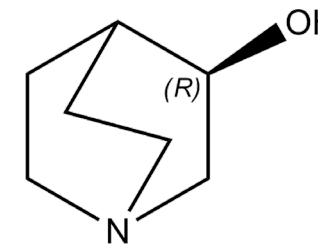
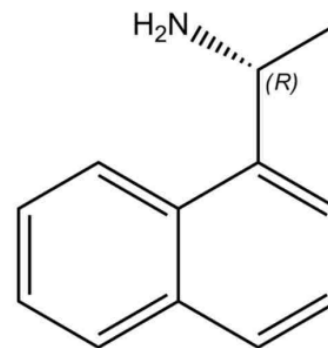
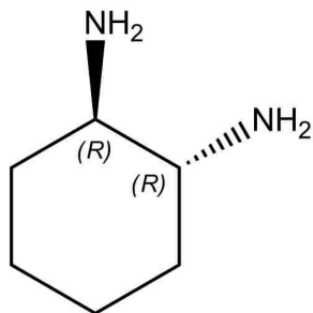
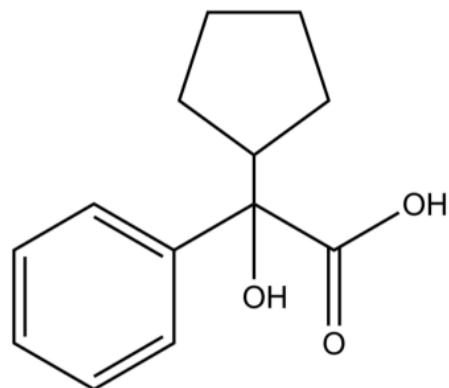
After optimisation

EUR €815 per kg

Core technology: Production plant



Case study: Regulatory starting materials



Cyclopentyl mandelic acid (and derivatives)	(R,R)-(-)-1,2-Diaminocyclohexane (and diastereomers)	(R)-(+)-1-(1-Naphthyl)ethylamine (and enantiomer)	(R)-(-)-3-Quinuclidinol
Glycopyrrolate (peptic ulcers)	Oxaliplatin (oncology)	Cinacalcet (hyperparathyroidism)	Ibuprofen (liposomal disease)
Hazardous Grignard chemistry	Classical chiral resolution	Leuckart chemistry	Biocatalysis technology
Maximum output: 12,000 kg per annum	Maximum output: 30,000 kg per annum	Maximum output: 20,000 kg per annum	Maximum output: 25,000 kg per annum

Core technology: Distillation

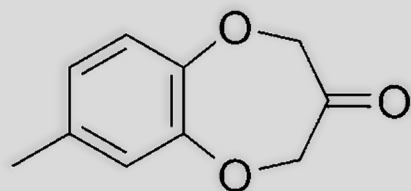
- Distillation of thermally sensitive materials
- Falling film, thin film and short path
- Up to 200 L per distillation
- Arran has three falling film distillation units

Vacuum	Down to 1 mbar
Output	Up to 15 kg per hour
Materials	Stainless steel and glass lined



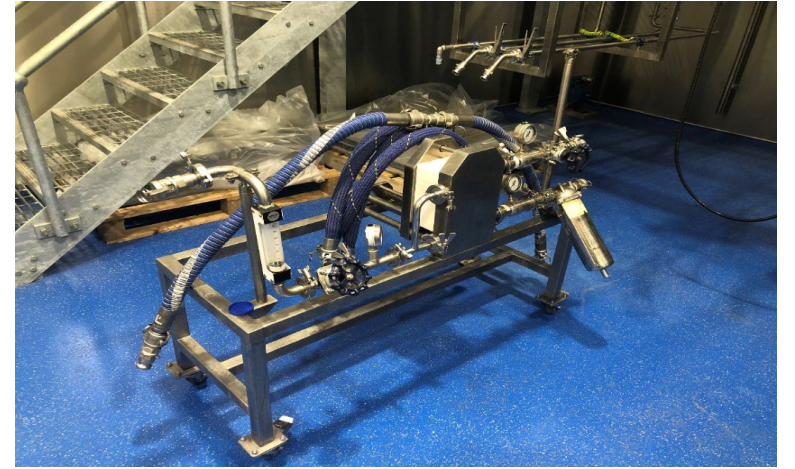
Case study: Manufacture of Calone (WMK)

- Europe's number one supplier.
- Up to 35,000 kg manufactured by Arran in Ireland per year.
- Industry leading purity with intense marine aromatic note.
- Industry leading quality and environmental standards.
- "Just-In-Time" supply from 25 kg to multi-tonne with short lead times.



Calone (Watermelon ketone)
CAS 28940-11-6

Core technology: Protein purification

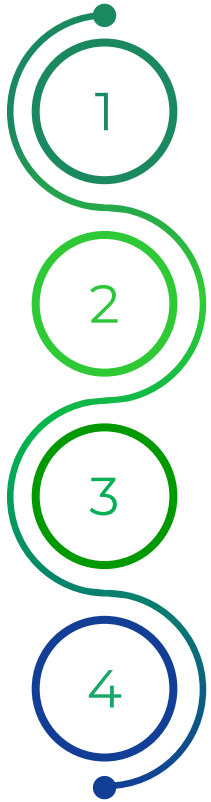


Case study: iLipase beads

- Lipase enzyme immobilised on methacrylate polymer beads.
- Process development on bead formation (polymerisation) and enzyme immobilisation.
- Three clinical trials batches successfully scaled up.
- Approximately 15,500 kg commercial batches manufactured.



Sustainability



1 Accountable waste stream processing

2 Strict control of gaseous emissions

3 Responsible Care® programme

4 Sustainable manufacture



Summary

- Arran builds long term relationships with companies seeking to develop and manufacture challenging fine and speciality chemicals.
- Manufacturing capacity is available at short notice.
 - This presents an excellent time to partner.
- Arran welcomes visits/audits of our headquarters in Athlone, Ireland and meetings at booth 715.



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