

Introducing

The logo for iosynth features a stylized green leaf icon above the word "iosynth" in a green, lowercase, sans-serif font.

Innovate. Optimize. Synthesize

Nov 2017

A smaller version of the iosynth logo, consisting of a green leaf icon above the word "iosynth" in a green, lowercase, sans-serif font.

Biocatalysis has significant advantages in green synthesis

Biocatalysts are commonly used in fats and oils, detergents, chemical and pharmaceutical, paper and the cosmetic industry.



Biocatalysts (enzymes) have a strong advantage over chemical catalysis, due to:

- More selective (enantio, regio, chemo) and can be evolved to be close to 100% selective
- Reduced or no use of protecting groups, minimized side reactions, easier separation
- Generally more efficient (works on lower dosage)
- Milder reactions, environmentally friendly and more sustainable

There are opportunities to leverage the commercially available biocatalysts as well as targeted development of new biocatalysts in the domains of pharma, cosmetics, and fine chemicals

Despite all the benefits, past and present barriers have limited the use of biocatalysts in chemo-industrial processes...

Technological Barriers

- Limited knowledge and setup to isolate novel biocatalysts
- Limited number of methods to engineer organisms
- Route scouting often limited to traditional chemistry
- Chemical and biological production processes not integrated

Educational Barriers

- Limited knowledge of enzyme/biocatalyst mechanisms
- Poor understanding of metabolic pathways, including pathway interactions
- Few trained scientists & engineers

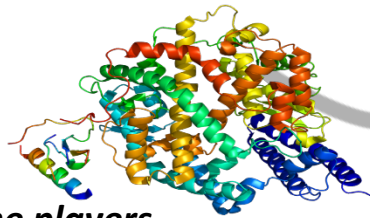
Economic Barriers

- high cost of producing many enzymes and co-factors for biocatalyst application
- Catalyst sometimes not available in bulk
- High loading requirement for some catalysts
- Business model of supplier / technology provider does not fit

Psychological Barriers

- Organic chemist mindset. Biocatalysis is often only thought of when traditional chemistry failed to achieve benchmarks
- Traditional chemistry has long history
- Low interest level for biocatalysis

... And most enzyme makers are often somewhat disconnected with pharma players, especially in Asia



Enzyme players

- Often lack regional presence – esp. in India
- Often do not understand generic pharma business
- Perceived to “push/sample” enzymes/kits – not process technologies necessary to drive implementation
- Insufficient regional technical service to implement the technologies
- Limited individual enzyme categories



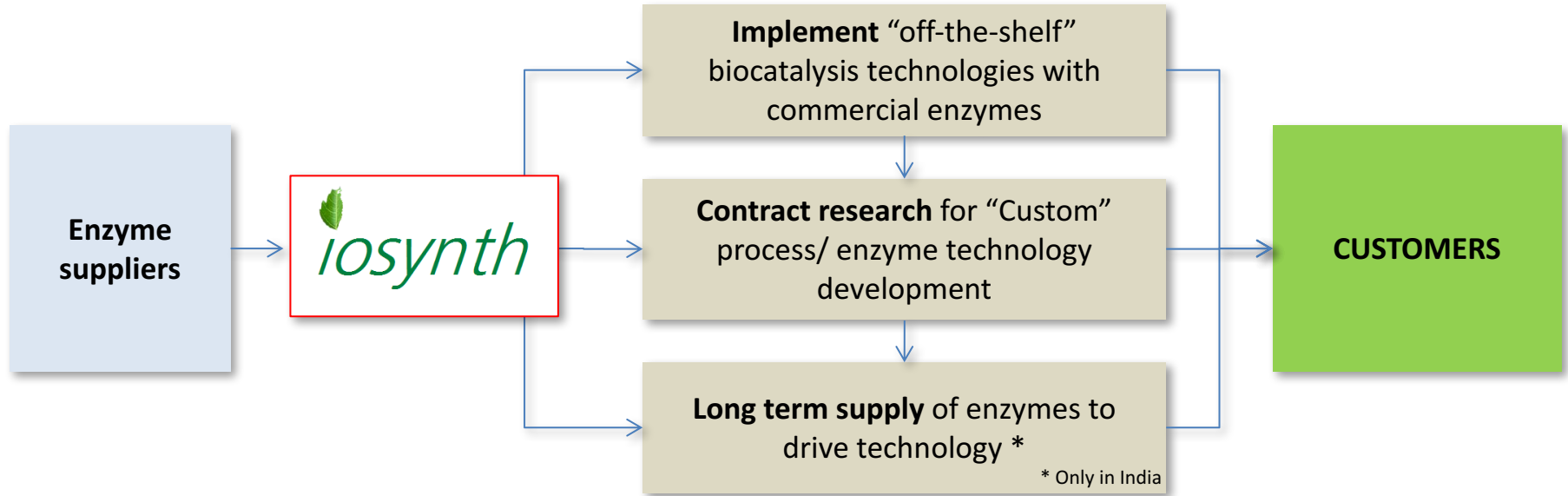
Pharmaceutical companies

- Would like to have more insights to the enzymes industry: available product portfolio, strengths & weaknesses of players, alternative suppliers
- Historically guided by traditional chemistry
- Often voice need for specific biocatalysis guidance and technical support
- Often have resource constraint from screening to upscaling the technology

***iosynth* fills the gap and connects the parties**



Iosynth is a biocatalysis service company to the pharma and fine chemical industry



The Foundation:

- Deep insights into enzyme producers globally and their respective product portfolio and strengths
- Art of applying enzymes and upscaling technologies to commercial scale

iosynth wants to make bio-catalysis easier and more accessible to our customers

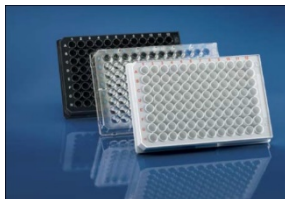
Our beliefs

- We strongly believe that there are many great enzymes in the market today for biocatalysis/chiral chemistry application
 - Many of them are available in bulk and have a broad substrate specificity
 - Some of them are very specific and niche
 - Strong potential still remains in wide set of applications
- We believe that in order to be successful with specific enzymes it is critical to draw on the right partners
- We also believe that finding the enzyme is a part of the job – applying it to the process at scale is when it creates value for our customers!

Our versatile team draws on experience across Microbiology, Biochemistry, Enzymology, Organic chemistry & Bioprocess technology to deliver comprehensive services to our customers

TEAM IOSYNTH CAPABILITIES

- Wide experience across enzyme classes (hydrolases, oxidoreductases, transferases)
- Experts in fermentative production of enzymes / whole cells
- Strong experience across pharma molecule types
- Comprehensive expertise in analytical methods (development/ analysis) – e.g. HPLC, GC, Mass , NMR
- Experienced in optimization of process parameters (enzymatic/whole cell)
- Practical experience and knowledge of downstream issues
- Conversant with typical pilot scale challenges
- Tested capability of successfully validated pilot scale processes
- Team with successful track of implementing several biocatalytic solutions in Indian majors



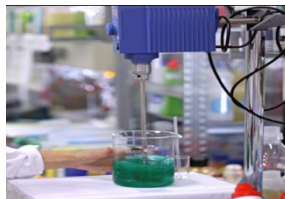
SCREENING

- Screen commercial enzymes for fast development
- Build and screen custom enzymes (incl. whole cell)



LAB POC FEASIBILITY

- Industrial benchmark driven POC (e.g. cost, yield etc.)
- Validation of Freedom to Operate



OPTIMIZE LAB PROCESS

- “Scale ready” solutions



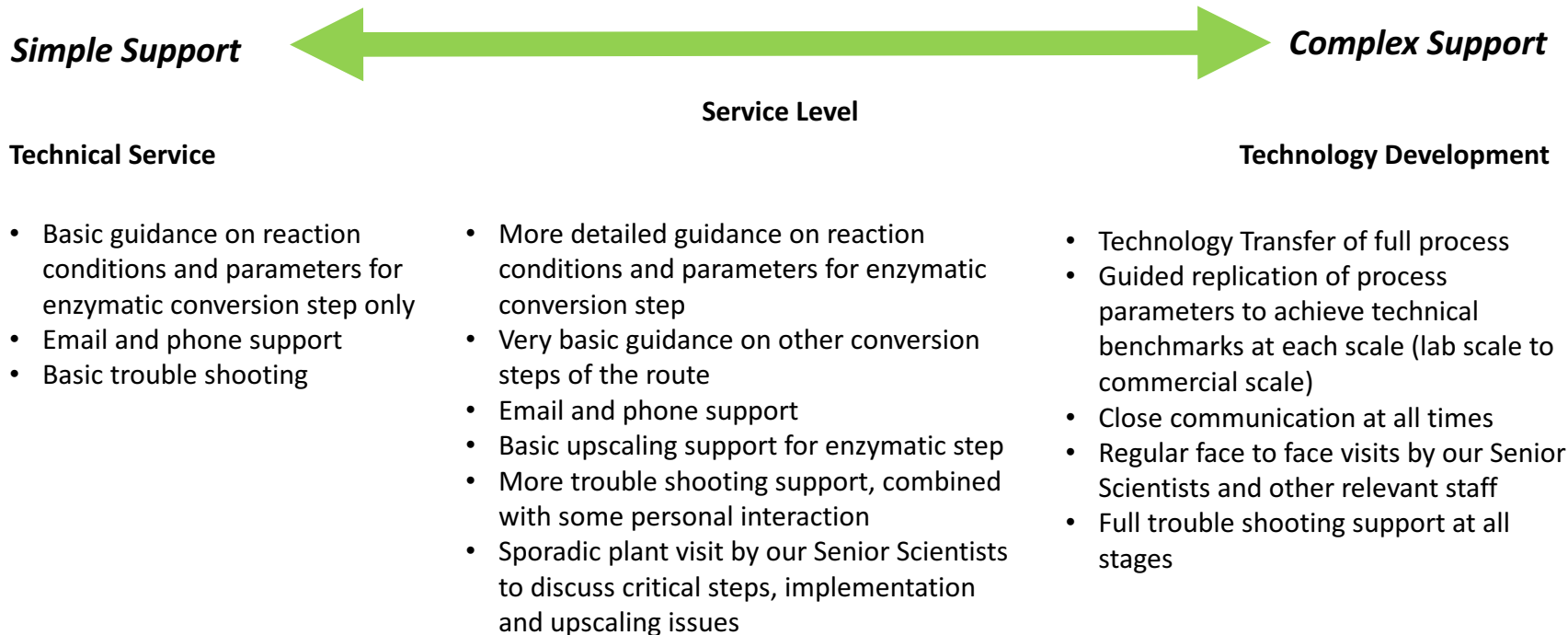
PILOT VALIDATION

- Offered “on site” at customer locations



COMMERCIAL SCALE UP

Iosynth offers a broad range of technical services, depending on the needs of our customers



Iosynth is unique in this field

Our model allows you to leverage the full power of the biotech industry portfolio

- **Our goal is your goal:** find the best enzyme for a reaction irrespective of who makes it
 - We work across enzyme producers
 - We are neutral: don't push any producer
- **We offer deep industry insights**
 - Who offers what
 - What has been used for similar reactions
- **Increase chances of quick success:**
 - We screen more commercial variants than any one enzyme provider can
 - Maximizes chances of getting a hit – eliminating lengthy and expensive enzyme development

We help implement the technology & also build “ready-to-implement” routes

- **Experienced staff able to upscale and implement swiftly & assuredly**
 - Technical staff with very strong biocatalysis and pharma background in commercial scale projects
 - Full process implementation, upscaling and process optimization support
- **Implementation service and support is offered across enzyme producers**
- **We will also bring selected, pre-developed “ready-to-implement” routes**
 - Allows for fast-tracked upscaling
 - Only very few resources required
 - Low risk, predictable outcome

We help you find the best supplier(s) for low-risk, consistent supply

- **Enzyme supply for your regular requirements**
 - We engage with enzyme producers at very early stage to ensure consistency and reliability of supply
 - We have distribution agreements with enzyme producers which allow us to supply the enzymes locally
- **Dual supplier option**
 - Although it cannot be guaranteed each time and with immediate effect, we can potentially develop alternative suppliers over time

Key capabilities of iosynth



Commercial: Sales & BD

- Deep insight into the enzyme industry
- Well networked techno-commercial team capable of driving technology sales
- Understanding and ideating on unmet needs
- Presence in India & South East Asia



Technology transfer & implementation

- Managing projects with customer teams
- Translating technologies from lab to pilot and commercial scale



Contract research & technology development

- Understanding customer needs, goals and scoping research projects
- Strong breadth of capabilities - from screening to optimization to upscaling
- Defining mutually acceptable gates/milestones



Distribution & supply

- Setting up long term supply contracts
- Logistics & warehousing



Technical Services & support

- Ensuring 1st level customer support and technical support for any customer issues related to products/technologies we supply

We are biocatalysis professionals

- ✓ We know this industry inside-out, and are able to draw on our understanding and experiences to the benefit of our customers.
- ✓ Using enzymes correctly lowers your cost and is more sustainable
- ✓ Accelerated implementation –esp. through tested, optimized process technology
- ✓ Guided implementation & technology transfer with post-implementation support
- ✓ Guaranteed, “best-in-class” enzyme supply
- ✓ Custom process/enzyme technology development for unmet needs

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