

Business, Enterprise & R&D

- Business, Enterprise & R&D
- Some thoughts
- 4 Challenges

- Access to Finance
- Access to People & Skills
- Access to Markets
- Intellectual Property



Business, Enterprise & R&D



- Business, Enterprise & R&D
- Example
- Microbial Solutions Limited
- Spin out from Oxford science area

microbial **SOLUTIONS**

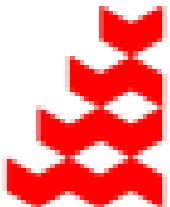


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Begbroke
Science Park



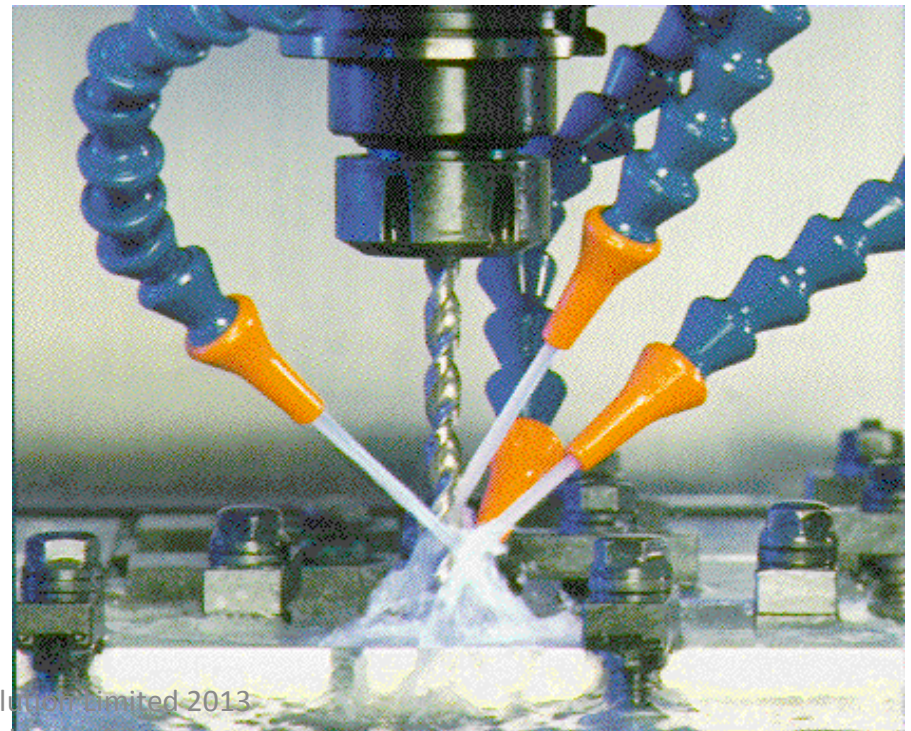
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NATURAL ENVIRONMENT RESEARCH COUNCIL



**NATURAL
ENVIRONMENT
RESEARCH COUNCIL**

Eco-friendly metal working fluid disposal



microbial SOLUTIONS

Eco-friendly metal working fluid disposal

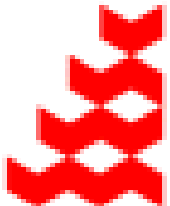


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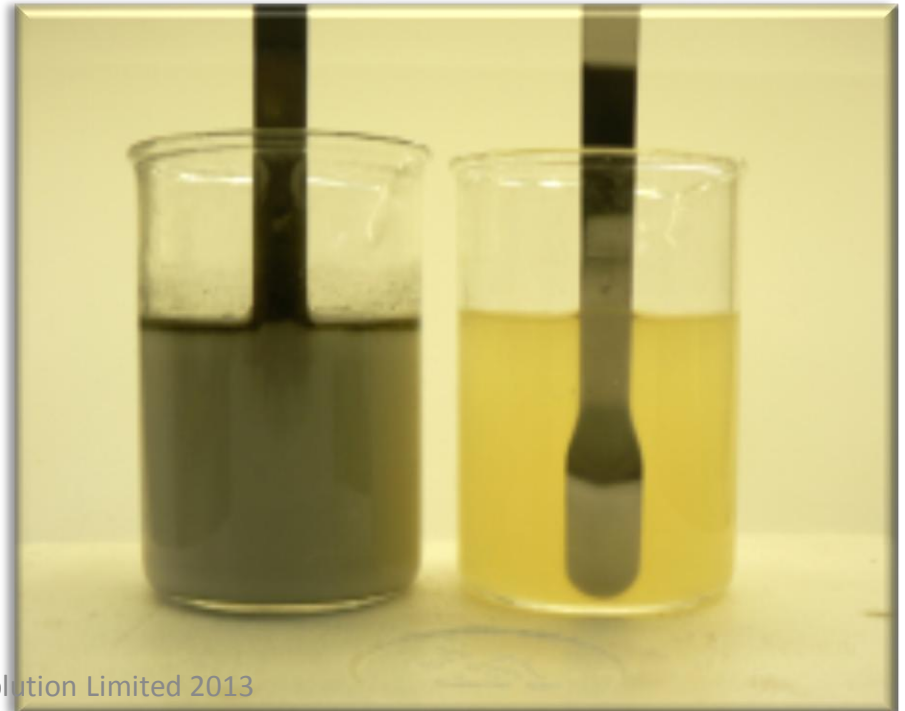


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*Ecologically friendly
metal working fluid treatment*



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**Engineering
Excellence
Award Winner
2008**



**Innovation Award
Winner
2008**



**Precision Engineering
Award Winner
2009**



**Environmental
Excellence Award
Winner 2011**



EDIE AWARDS
SHORTLIST ANNOUNCED

**Best New Product
Finalist 2011**



**Best Green Technology
Award Finalist 2011**



**Best Early Stage
Biotech Finalist
2009**

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**Best Early Stage
Biotech Winner
2010**

-
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Access to Finance - how much? Entrepreneur's typical view

€'000s					
Year	1	2	3	4	5
Income	0	0	500	1000	3000
Operating costs	(500)	(500)	(750)	(1000)	(1000)
EBITDA (~Cash)	<u>(500)</u>	<u>(500)</u>	<u>(250)</u>	<u>0</u>	<u>2000</u>
CUMULATIVE	(500)	(1000)	(1250)	(1250)	750

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Access to Finance - how much?

VC view - “twice as long”

€'000s							
Year	1	2	3	4	5	6	7
Income	0	0	0	0	500	1000	3000
Operating costs	(500)	(500)	(500)	(500)	(750)	(1000)	(1000)
EBITDA (~Cash)	<u>(500)</u>	<u>(500)</u>	<u>(500)</u>	<u>(500)</u>	<u>(250)</u>	<u>0</u>	<u>2000</u>
CUMULATIVE	(500)	(1000)	(1500)	(2000)	(2250)	(2250)	(250)

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Access to Finance - how much? VC view - “twice as expensive”



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Access to Finance - how much? VC view - “half as good”

€'000s

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Access to Finance - how much?

VC view - “half as good”

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Access to Finance - where?

Technology Strategy Board Driving Innovation

“The Technology Strategy Board is the UK’s national innovation agency. Our goal is to accelerate economic growth by stimulating and supporting business-led innovation.”

Access to Finance - where?

Technology Strategy Board Driving Innovation

“Our Toolset

Range of Tools with different objectives / characteristics”

SMART

SBRI

Collaborative R&D

_connect

Knowledge Transfer Partnerships

Knowledge Transfer Networks

Launchpad

Catapult

Access to Finance - where?

Technology Strategy Board Driving Innovation

“Our Toolset

Range of Tools with different objectives / characteristics”

..... Catapult

Eurostars

Innovation and Knowledge Centres

Innovation Vouchers

Entrepreneur missions

Access to Finance - where?

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Technology Strategy Board

Driving Innovation

- Available?
- typically “early” or “seed” - €5k - €25k
- typically “follow on” - €250k - €1m

Access to Finance - where?

- Heirarchy
- Family & friends
- Angel investors
- Seed funders
- Venture capital
- Industry partners

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- Business, Enterprise & R&D
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 - Intellectual Property

Academic Founders & MSL management



**Prof. Ian
Thompson**



Oxford University
Begbroke
Science Park



Prof. Will Pope
Director



**Dr Chris van
der Gast**



**Centre for
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NATURAL ENVIRONMENT RESEARCH COUNCIL



Dr Duane Ager
Chief Scientific
Officer

Human Resources - a board

- **Directors**
- Prof William Pope

- **Non executive**
- David Whitby (ex BP Sunbury, Chairman)
- Prof Geoff Randall (representing NERC)
- Dr David Kelly (representing H2O Venture Partners)
- Mark White (representing Rainbow Seed Fund)
- Colin Watts (representing Oxford Capital Partners)

Human Resources – a team

- **Employees**
- Dr Duane Ager (Chief Scientific Officer)
- Dr Kim Thompson (Chief Technology Officer)
- Colin Bryan (Chief Engineer)
- Roberta Miles (Chief Financial Officer)

- Dr Catie Williams (Quality and admin manager)
- Monika Szkudlajska (Project Implementation Lead)
- Callie Bowyer (Senior Lab Technician)
- Rob Hull (Technician)
- Patrick Thill (Technician)

- Key vacancies – about to start
- Laboratory manager – Dr Vince Mason
- Site implementation engineer/technician(s) – Jimena Sarli Quevedo

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- Business, Enterprise & R&D
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 - Access to Markets – “VALUE PROPOSITION”
 - Intellectual Property

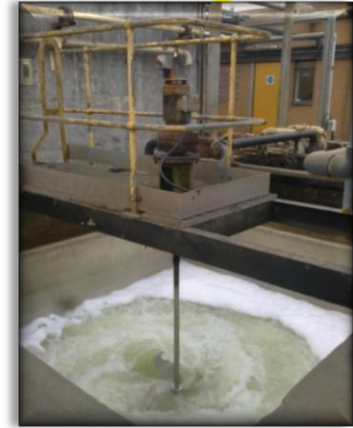
Current Treatment & Disposal of metal working fluids

- **Physico-chemical treatment facilities**
- **Ultrafiltration, flash/vacuum evaporation**

- energy intensive (expensive)
- effluent still requires disposal
- often poor quality
- cannot remove some toxic components
- no water re-use or recycling

- capital intensive
- poorly scalable on cost
- large plant needed to treat pollution load of modern MWFs

- **With:**
- **additional transportation costs**
- **large volumes of residual waste sludge (typically 15- 25%)**
- **and**
- **WITH NEW MWFs, A NEW WASTE SLUDGE PROBLEM CREATED IN OPERATION**



The Microcycle™ Technology



Microcycle™ is a biological process with an integrated water recycling system

Low energy, water reduction and water recycling

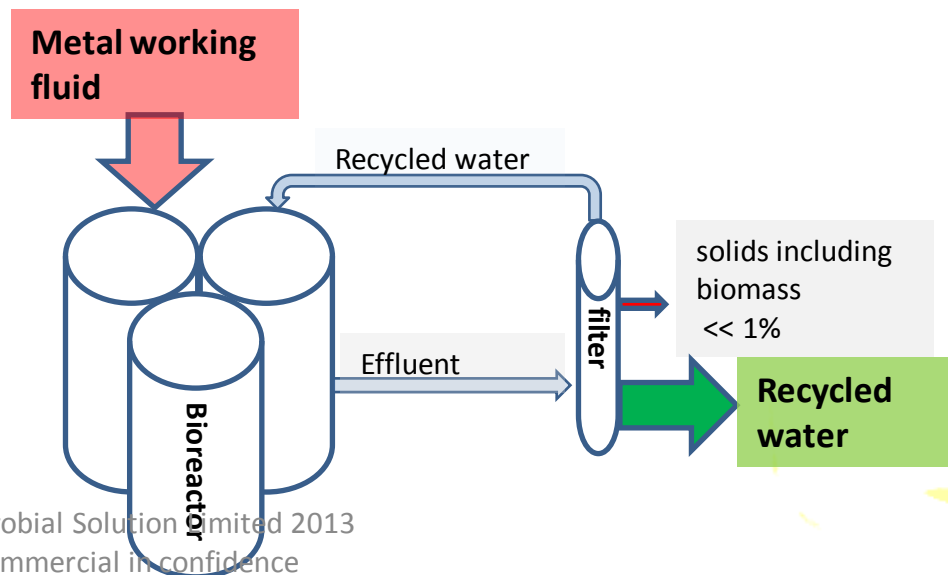
STEP 1 - naturally occurring bacteria do the “hard work” and break down up to 98% of the pollution load - “let the bugs do the work”

- ✓ energy use reduced by up to 85%
- ✓ water use reduced by up to 95%
- ✓ solid waste reduced by up to 96%
- ✓ breaks down and removes toxic components
- ✓ on site treatment & simple hardware can be integrated into existing treatment systems
- ✓ reduces down stream processing costs



STEP 2 - filter polish removes the very small amount of residual solid (<1% of waste stream volume)

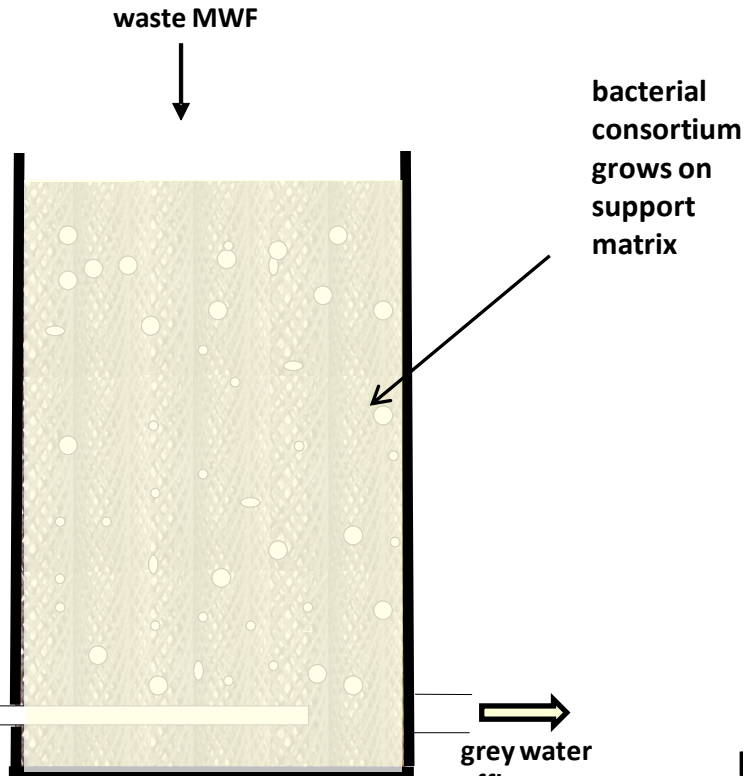
- ✓ polishing step removes any residual bacteria, and further reduces already low chemical oxygen demand
- ✓ zero residual solids in the effluent
- ✓ water effluent available for re-use
- ✓ water effluent available for re-cycling , or
- ✓ good quality grey water disposal straight to sewer



The Microcycle™ Technology



AIR
PUMP

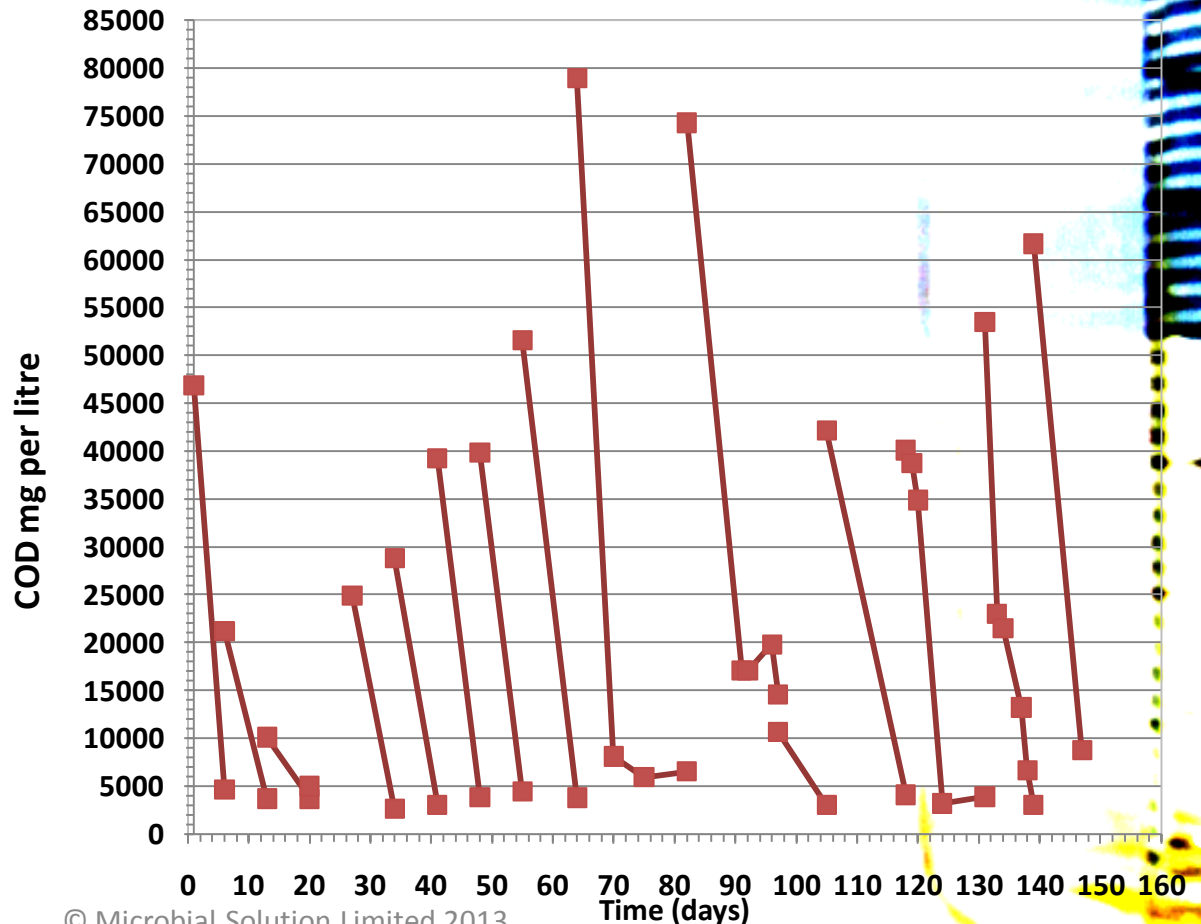


Full Scale bioreactor at BAE Brough Aerospace Manufacture

BAE SYSTEMS



Pollutant load reduction - chemical oxygen demand



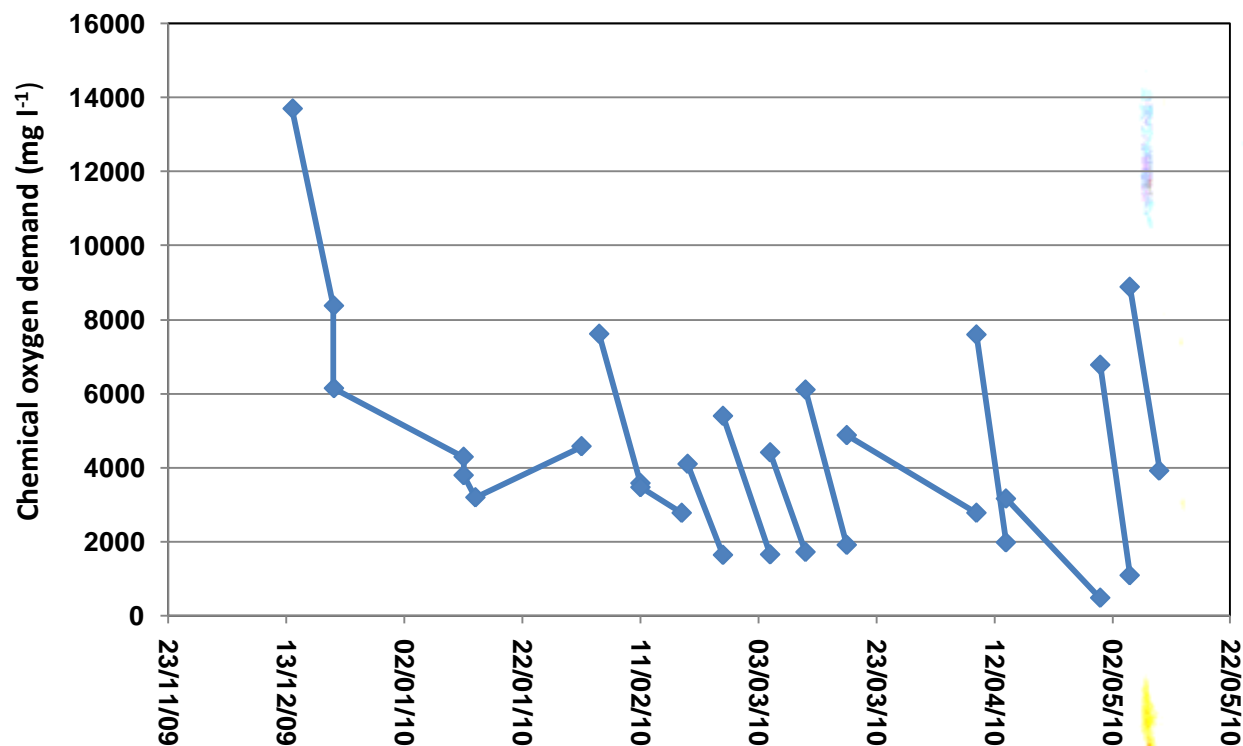
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Full scale bioreactors at Ford Bridgend Engine Plant

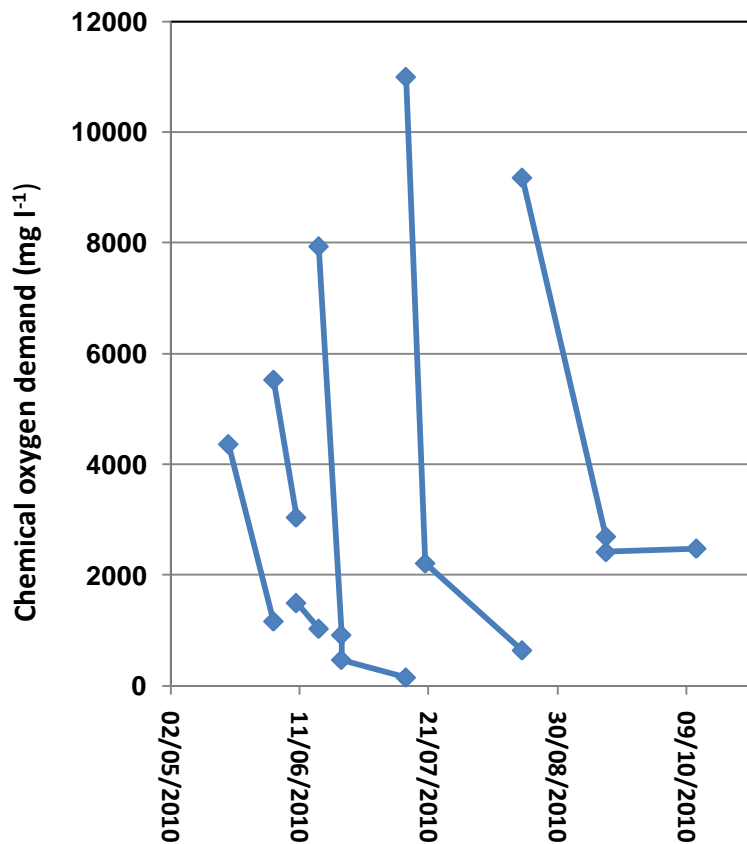


COD removal - initial 5 tonne bioreactor

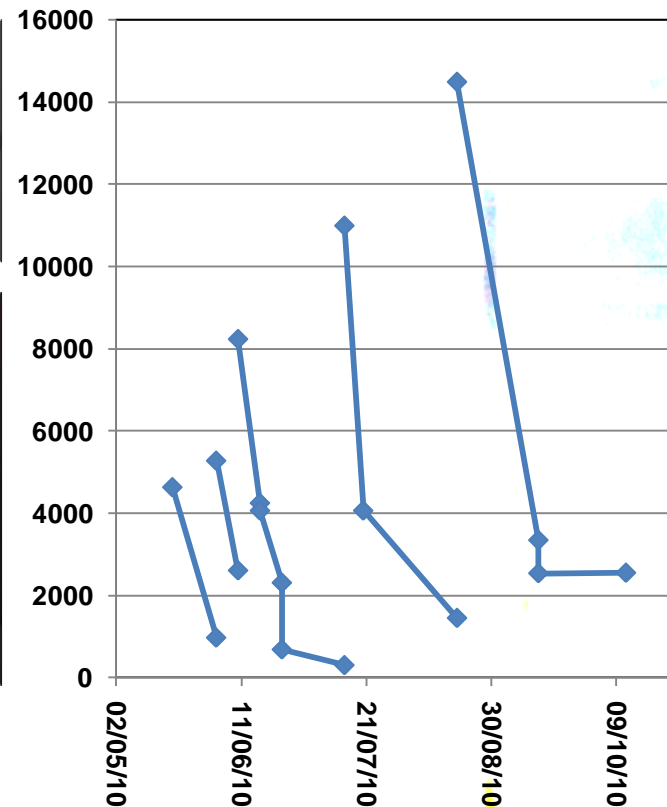


Full scale bioreactors at Ford Bridgend Engine Plant

10 tonne - 'L' reactor

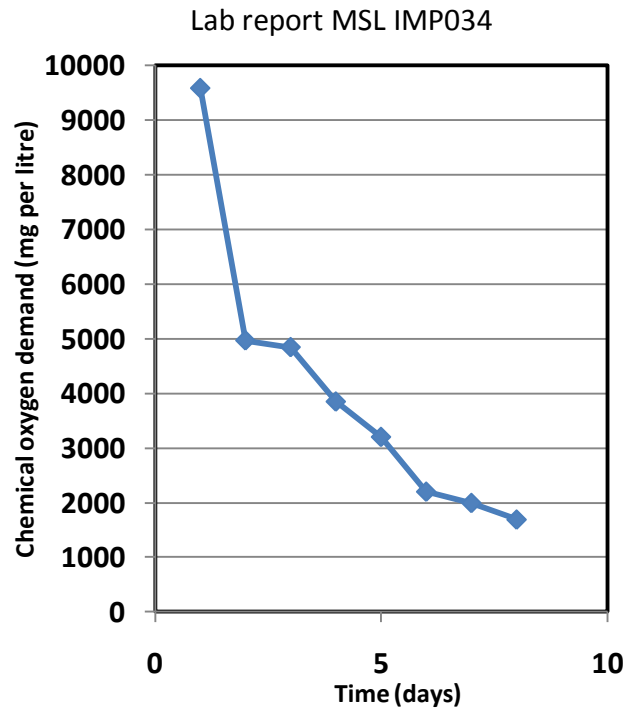


10 tonne - 'R' reactor

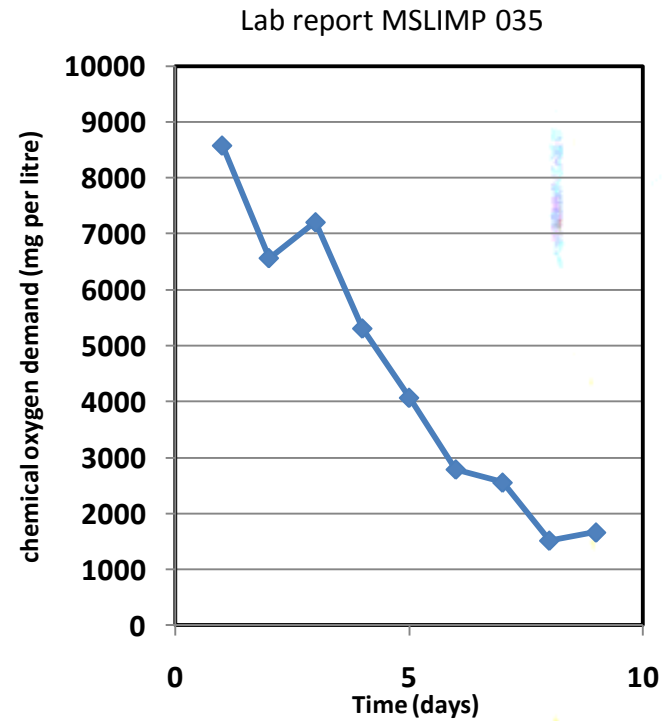


Biological treatment of Ford Sharonville CareCut SM451

CareCut SM451 from Ford Sharonville treated in a Microcycle™ batch bioreactor



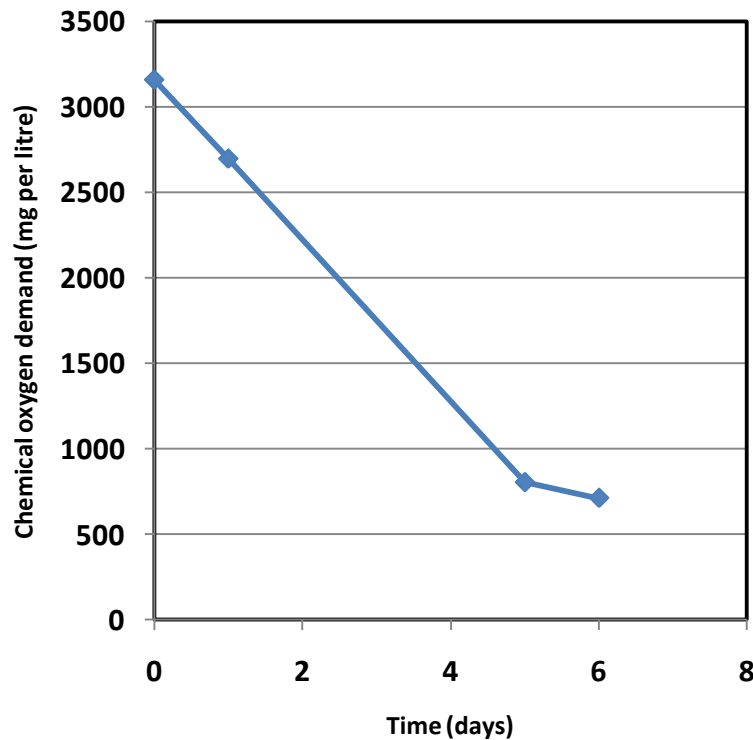
82% COD
removal



80% COD
removal

Treatment of oily sludges at Ford Dearborn using Microcycle™

Oily top sludge, Ford Dearborn



- surfactant solubilised top sludge degraded on a Microcycle™ bioreactor

- 77% COD removed on 1st commissioning run

- bioreactor will treat higher COD loadings with greater efficiency in a shorter residence time in subsequent batches

The Microcycle™ technology – VALUE PROPOSITION



- can be supplied as a complete design or integrated into existing treatment systems to increase efficiency and reduce running costs
- eco-friendly biological process
- low energy operation
- breaks down biocides and toxic components
- water is recovered for re-use
- cost effective
- hardware and tankering costs greatly reduced

The Microcycle™ Technology – VALUE PROPOSITION



Low energy, water reduction and water recycling

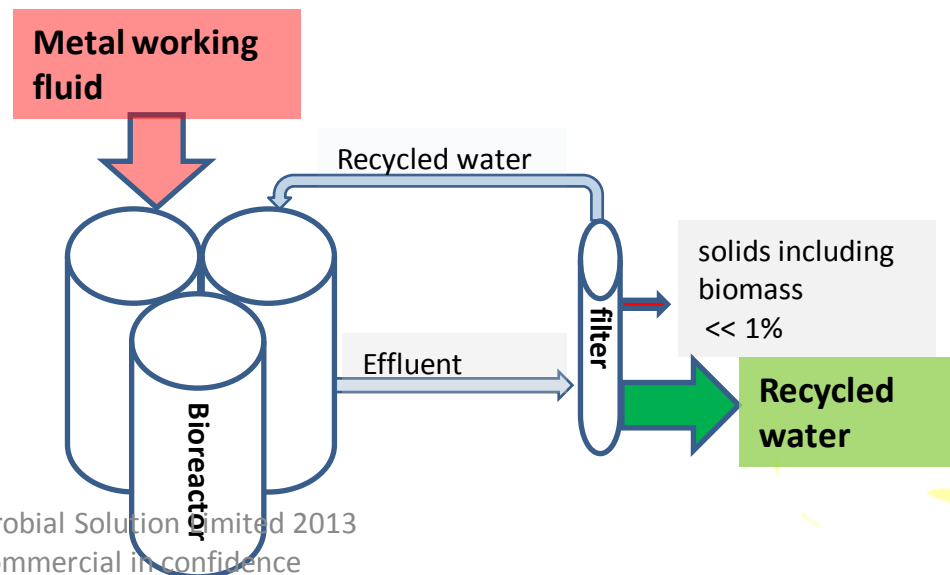
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Intellectual Property

- Copyright
- Trademarks
- Patents
- Industrial designs
- Confidential information
- (“trade secrets”)
- (“know how IP”)
- Geographical indications



- **What can IP protection deliver?**
- Return on investment for R&D
- Revenue streams – IP licensing/assignment
- Defensive strategy – deter third parties
- Act on infringements by third parties
- Cross-licensing
- Encourage creativity in the business

- Creates value for the business – intangible asset
- Helps to secure investment

- **Patenting -v- academic publishing**
- File for patent protection **first**
- **This is very very important**
- Then publish second = public disclosure
- Many academics still get this wrong

Intellectual Property - working with academic partners?

- Patent
- File fo
- This is
- Then p
- Many



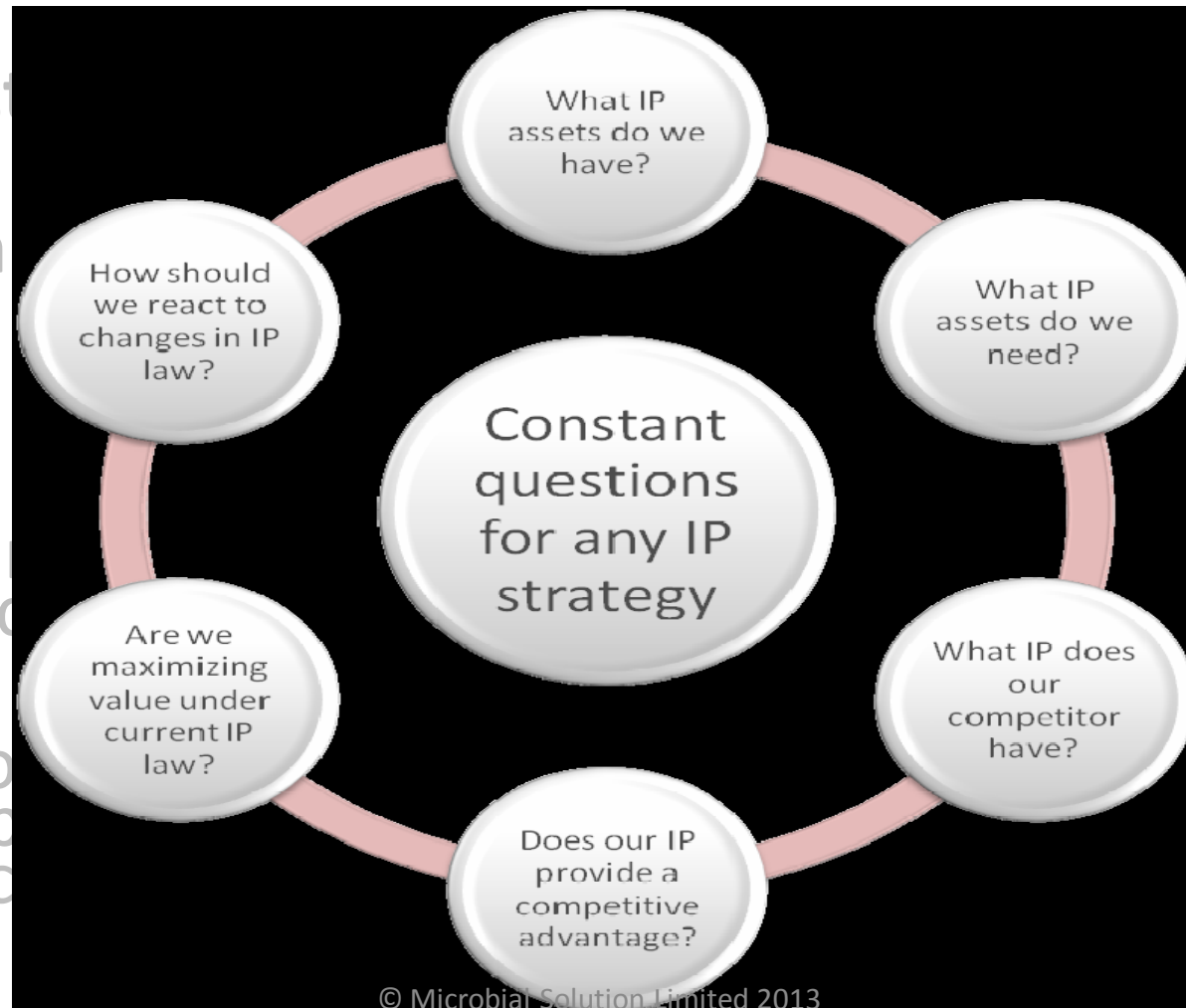
- Therefore it is **extremely important** not to **publicly disclose** an invention **before** filing a patent application



- **Structuring the IP process**
- Businesses must be able to spot their IP
- Once spotted – look after the IP and **protect** it
- Are processes in place to prevent leakage or public disclosure?
- Do your researchers maintain good laboratory notebooks to document conception and reduction to practice of inventions?

Intellectual Property

- Struct
- Busin
- Once
- Are p
public
- Do yo
noteb
reduc



Intellectual Property

- Struct
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public
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notab
reduct



- **Patenting - estimated typical costs**

- Initial drafting: c. £3-5k 0 months
- PCT filing: c. £4k 12 months
- PCT stage: c. £1.5k 18-24 months
- National/regional phase: 30/31 months
- Filing/prosecution/grant: c. £5-10k **per country**
- Renewal fees in each country to maintain patent

Intellectual Property - National and Regional phases

- Patent costs

- Initial 0 months

- PCT 12 months

- PCT 18-24 months

- National 30/31 months

- Filing 10k per country

- Renewal to maintain patent



Intellectual Property - National and Regional phases

- Pat
- Init
- PCT
- PCT
- Nat
- Filin
- Ren



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- Business, Enterprise & R&D
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-
- Business, Enterprise & R&D
 - There are actually 5 challenges
 - Access to Finance
 - Access to People & Skills
 - Access to Markets
 - Intellectual Property
 - **Business Plan**

-
- Business, Enterprise & R&D
 - There are actually 5 challenges
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 - Business Plan - People - Plan - Passion

- Business, Enterprise & R&D
- There are actually 5 challenges ... no - 6
- Access to Finance
- Access to People & Skills
- Access to Markets
- Intellectual Property
- Business Plan - People - Plan – Passion
- Cognitive bias in R&D
-

- Business, Enterprise & R&D
- There are actually 6 challenges ... no - 7 ... 8? ...
- Access to Finance
- Access to People & Skills
- Access to Markets
- Intellectual Property
- Business Plan - People - Plan – Passion
- Cognitive bias in R&D
- Market resistance to new products...legislative bar..

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*Ecologically friendly
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