**Biomixing**

**What’s the product?**

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| Innovative bio reactor. Or is it a complementary technology which adds to exiting reactors? |
| A bioreactor propeller designed based on fluid dynamics simulations |
| New modeling technology to allow for improved mixing and therefore performance of large bioreactors |
| Biosensor |
| Impeller? retrofit bioreactors? |
| Improvements to bioreactors to help with yield time and money |
| A cell mixer to save costs to pharma companies ? |
| Bio reactor parts |
| Agitation systems for bioreactors |
| Improved bioreactor |
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| Improving efficiency and cost of Bioreators |
| A new method/pipeline to improve bioreactors efficiency. |
| bioreactor |
| Improved Bioreactors for Cancer treatment |
| Optimized components that can improve bioreactor processing time |
| Technology to improve agitation and aeration in bioreactors |
| CFD simulation for new bioreactors and retrofitted ones by optimizing impeller and aerator design to ease the scaling process, reduce shear stress and mixing time, result in better mixing, and save money. |
| Improved bioreactor |
| A new bioreactor to increase pharma drug and vaccine production P |
| Biomixing for biological manufacturing |
| a bioreactor capable of reducing the scale, time and cost of biotechnological processes used to develop products such as vaccines or other pharmaceuticals. |
| Customized bioreactors. |
| BioMixing |
| Bioreactors are based on fluid dynamics. |

**What’s the problem they are trying to solve?**

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| There are many. We need to have better evidence of the problem from users and potential clients. Also more data on the potential cost/benefits. |
| Challenges to manufacturing complex biologics and vaccines in terms of speed and quality |
| Improved fermentation and performance from bioreactors |
| Not sure... |
| Improved efficiency of bioractors? |
| Inefficiencies in bioreactors that are needed for broad diagnostic and therapeutic applications |
| Mixing of cells |
| The inefficiency of some reactors |
| Efficient mixing on bioreactors to improve production. |
| It shortens and improves the process's quality, making it less expensive. |
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| Making bioreactors more efficient: Time, Quality, cost |
| Lower production times in bioreactors, achieving better times to market for pharma products. |
| efficiency and quality of the bioreactor |
| Not so clear to me. Improvement in the production (reducing mixing time) |
| Reduce the culture time in bioreactors. |
| Improving efficiency of bioreactors impacting yield and cost. |
| current bioreactor processes take too much time, suffer from poor product quality (homogeneity, high shear stress), expensive equipment, and too many steps required for effective scaling. |
| Shorten manufacturing time and lower costs |
| Current manufacturing is slow and tough to scale |
| Speed of manufacturing process |
| the long waiting times and high cost of current industrial bioreactors |
| Making bioreactors more efficient. |
| no idea |
| Reduce shear and mixing time by 50%, better mixing, better quality. |

**Comments/Questions**

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| Which of the novel features you mentioned are fully covered by the patent, as original claims? What prior art, that is, existing technologies, does the patent assume?  What do you think will be the best way or industry sector to launch the product? Or will you try to license the technology to existing manufacturers, and not try to produce the technology yourself? It looks expensive to test and produce? |
| Price and scalability / sustainability of this business model are key elements here that will help you to grow your customer base as well as the generalizability of this approach to more complex systems like engineered cell therapies. Can you show more details about the validation of the system? A more detailed business model and plans for the future will be good to see. |
| This sounds like it could be exciting. There is a huge issue with COGs in biopharma and if you can identify the improvement and show increased cost or performance this could be compelling.  If you've looked at human cells have you seen if you have more appropriate post-translational modifications or other protein processing to get more robust yields of the appropriate protein form? Decreased host cell protein or toxic intermediates etc? If this improves the downstream processing steps by cleaner inputs that would also be of value  What area has the biggest pain points - ex. antibody production in CHO? Some biologics in rare disease etc? Are there exceptionally sensitive cells and/or those that need extra oxygen for whom the standard bioreactors cannot work - ie who needs this the most!     Once you license/sell these impellers etc to the large companies for particular applications, how do you have continued revenue? |
| Explain in a less technical words what will be the added value of this technology |
| Intro re delayed cancer diagnosis and vaccine production was interesting, but it didn't really help your story. If you start with a story, you should see if you can conclude by showing how what you do changes the outcome of that story. It seems that cancer Dx or Rx is pretty far removed. Vaccine production may be closer if you can explain the specific deficiencies in bioreactors that, if corrected, would lead to a greater rate of production. |
| Would be good to better understand the true economic value of this, and how much it can scale. Seems to be a good idea for a small business to tackle on a local level, but it’s unclear how the next leap beyond local small clients occurs. |
| 1. What's your value proposition  2. Why do customers want to purchase you?  3. What's your revenue model / business model |
| None |
| Is there any regulatory barrier to cross after you modify the bioreactor? (CE Mark, etc...)  Is it a general solution for a model of bioreactor or do you need to optimize for each application?  What is the business model underneath? I take right now you are a consulting firm transitioning to other models. Do you have the path clear? |
| I would like to know the estimated economic impact of this product. |
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| 1) Strong team with existing clients: This provides good credibility  2) Have developed early prototypes: That is excellent: Are there any early results?  3) How does your system integrate with existing bioreactors?  4) Time to market? |
| How would your solution fit the current market? In terms of:  - could previous reactors be updated, or do they need to be completely replaced?  -whats the overall cost compared to a standard bioreactor? If it is more expensive, is that increase in initial cost something that could be short-term recovered because if the increase in performance? |
| How do you expect the cost for the maintenance in the short-term and long-term? Advanced equipment like this will certainly require high-level maintenance and uniform yield over time should be secured. Maybe I am having this question since I do not know the exact mechanism. Looks great! |
| I would recommend making the global impact more clear. Let's say: with standard method, X can produce Y. With our product, the total production in the same amount of time would be Z. The reduction in time translates into XX dollars. |
| You talked about targeting users directly, so I assume bioreactors are open systems that can be tuned to include your technology. Have you thought about designing a complete new bioreactor based on your ideas? |
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| Multiscale simulation: large tank with mechanical impellers to minuscule biological cells. Do you explicitly model the cells or is there a way to correspond their properties, such as size and chemistry, to physical inputs to the CFD such as viscosity? |
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| So this is a simulation of the bioreactor process to make a more efficient process?  Are you suggesting new equipment to the drug companies?  If you change the Manufacturing process, at least in US and possibly in EU, you may have regulatory hurdle because the regulatory bodies approve/approve the process. |
| The presentation and website are good at explaining your value proposition (decreased time, reduced shearing, higher yield, etc.) |
| none. I'm unfamiliar with this kind of technology or space. |
| I understand better with the last PPT with the video. Thank you.  **From the chat question burst:**  How much time and money does this save?  What is the long term performance of this new design? Is there a bigger cost for upkeep over time relative to old systems that might negate its value?  So you are simulating the current process to make it more efficient. Are you using the same equipment already in use or suggesting different equipment?  Is there an application where this is most impactful? (Cancer v Covid v other)  Is it a general solution for a model of bioreactor or do you need to optimize for each application?  Do you have data showing improved yield, cell viability etc? Do you have data from CHO or other mammalian cells?  Are there certain product categories where this is a more useful advance than others, e.g., antibodies vs vaccines??  What is the addressable market size for this? And is there recurring revenue over time once you retrofit the mixers, or is it a one time revenue opportunity?  Multiscale simulation: large tank with mechanical propellers to minuscule biological cells. Do you explicitly model the cells or is there a way to correspond their properties, such as size and chemistry, to physical inputs to the CFD such as viscosity?  How do you ensure the integrity of the solution is maintained  Is there any regulatory barrier to cross after you modify the bioreactor?  Do you re-design the impeller based on the CFD model? Why does it need to be so specialized?  What are the inputs/outputs of the simulation?  Which of the novel features you mentioned are fully covered by the patent, as original claims? What prior art, that is, existing technologies, does the patent assume?  Is there potential to partner with current bioreactor manufacturers to include these propellers in new mixer design in addition to retrofitting?  Do you have an estimation of the overall economic impact in some specific case (Yours vs Standard)?  The reduction of 70% time is really good, but what is the final impact on the total production time?  Who pays for your agitators? The end user or the manufacturer? |