



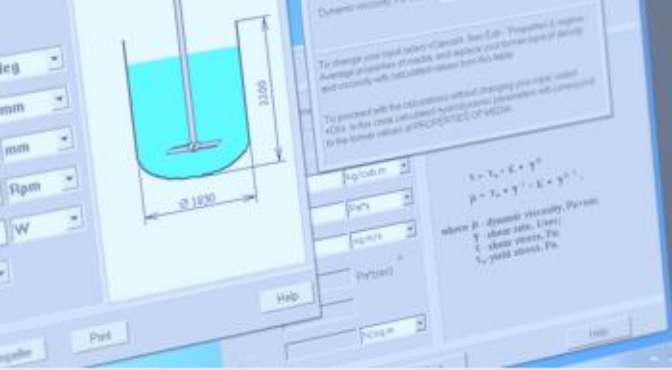
Simulation of Mixing Processes

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E-mail: info@visimix.com



VisiMix Certificate

Moshe Bentolila

CORONAVIRUS PREVENTION



AVOID



KEEP CLEAN

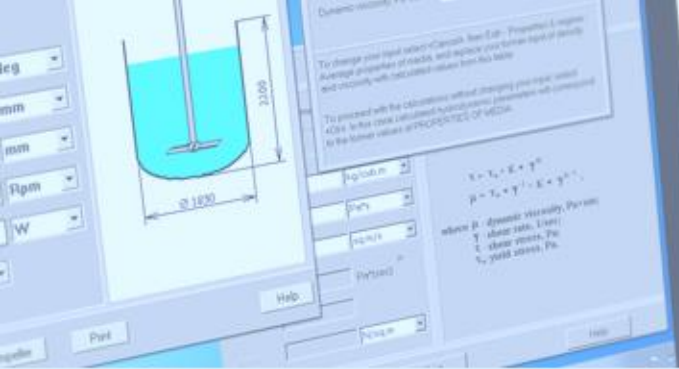


DISINFECTANT



SYMPTOMS AWARE





Certificate of Completion

Awarded to

YOU

*For the successful completion of
The VisiMix Basic Training Course*

Gad Amir

Date

Gad Amir, VisiMix CEO



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About Us

VisiMix.Ltd is a unique software enabling chemical engineers, process engineers and R&D personnel to characterize and visualize mixing processes via a simple, user friendly interface.



Our products allow significant savings in time and costs by drastically reducing the need for trial-and-error. They have been successfully adopted by hundreds of companies.

Simple and Effective

A small, square inset image showing a 3D simulation of a mixing process. It depicts a blue, Y-shaped mixing element at the bottom of a container, with a textured, grainy surface representing the material being mixed.

Technology - Simulation of Mixing Processes

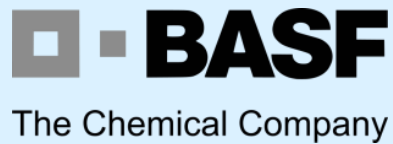
- The First and the only tool in the Industry
- Reliable and accurate results
- Based on More Than 300 Man Years of R&D and Industry Experience
- Replacing Pilot Experiments
- Accelerated Time-to-Market process
- User Friendly and easily accessible



About Us

- VisiMix is based on a physical models supported by empirical data , in a way that solves momentum balances depending on the existing equipment.
- The phenomena of the flow in the vessel is taken into account using many theories such as the **Mixing Length of Prandtl theory, Kolmogorov theory** and many others describing one or more phase systems.
- Considering this and all the experimental coefficients that were evaluated, it is possible to **calculate many mixing parameters** corresponding to a specific process using VisiMix and **their influence in the process**.

Customers & Markets



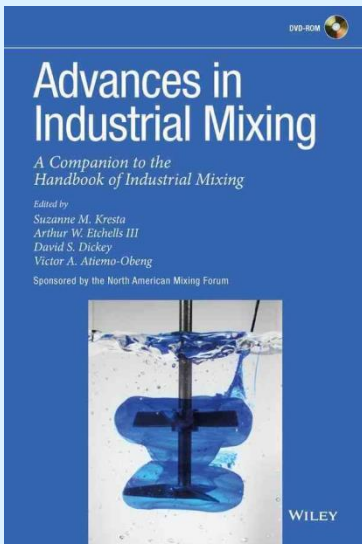
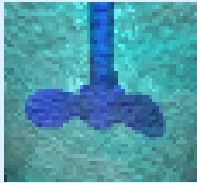
What Our Customers Say About Us

From the Dow Chemicals Intranet Website

“VisiMix: This is a **highly accessible PC software** for mixing calculations available from VisiMix Ltd., an Israeli company. It is **a rating calculation tool** for both non-reactive and reactive mixing involving blending, solid suspension, gas dispersion, liquid-liquid dispersion, or heat transfer processes in stirred vessels. It calculates the important process parameters for single- and two-phase systems – power consumption, circulation rates, local concentrations of solutes and suspended particles, drop size, concentrations of reactants, etc ...”

Dr. Victor Atiemo-Obeng

Dow Chemicals Co.



Customers and Markets

- | | | |
|------------------------------|----------------------------|---------------------------------|
| 1.3M, USA | 19.Honeywell-UOP | 37.Solvay |
| 2.Afton, USA | 20.Ineos Styrenics | 38.Tecnicas Reunidas |
| 3.Air Products, USA | 21.Lubrizol | 39.Tecnimont, Italy |
| 4.Alkermes | 22.Merck - Schering-Plough | 40.Teva Global |
| 5.AllessaChemie | 23.Mitsubishi | 41.US Navy, USA |
| 6.ASEPCO | 24.NALAS-Jerry Salan | 42.Alcon, USA |
| 7.Ashland Hercules | 25.Nan Ya Plastic | 43.Arizona Chemical |
| 8.BASF, USA | 26.Nippon | 44.JM Huber |
| 9.Belinka Belles | 27.Novartis | 45.Jotun |
| 10.Celgene | 28.NRDC, India | 46.Lek |
| 11.Chemagis | 29.Ocean | 47.Matrix\Myran |
| 12.DeDietrich | 30.Pfizer | 48.MJN - Mead Johnson Nutrition |
| 13.Dow chemical | 31.Polimeri | 49.Ranbaxy |
| 14.Eni - Milan | 32.Praxair | 50.R.C.Costello |
| 15.Evonik Degussa | 33.Ranbaxy | 51.Styron |
| 16.GE Technologies | 34.Samsung, Korea | 52.Tami |
| 17.GE Healthcare | 35.Sunovion Sepracor | 53.Taro |
| 18.Global Tungsten & Powders | 36.SES | 54.Xellia |
| | | 55.Ash Stevens Inc..... |

Total > 250 customers



Motivation

Common Questions



- ✓ Did we cover the main parameters during the process development?
- ✓ Will our facilities will be appropriate for the developed process?
- ✓ Does the equipment offer is good for the process?
- ✓ What about safety and runaway scenario?
- ✓ Do our process is robust?
- ✓ Does the operational range parameters are large enough for the manufacture facilities?

The Goal

Once the Science of the process (Chemistry, Biology or physics) is known well, a common situation during the process transfer from lab to production or from site to site is the gap between the old and new results.

- ❑ **Our first goal is to develop a process that will run properly in the first trial on a new scale or site, similar to our successful results in the lab or in the old facility.**

In order to achieve this, we need to evaluate the process with the same conditions we will have in the production phase.

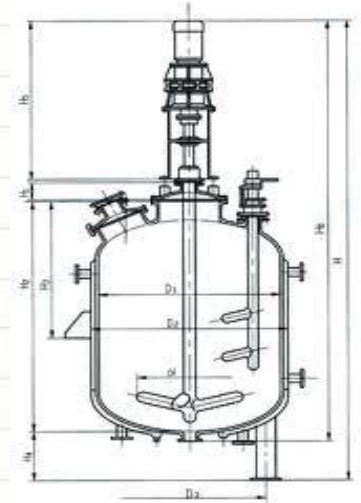
- ❑ **The main parameters we change are the hydrodynamics of the system. If we are able to identify and control these parameters we will be able to achieve to the available and optimal solution.**

Data and Results Management



R&D

Design

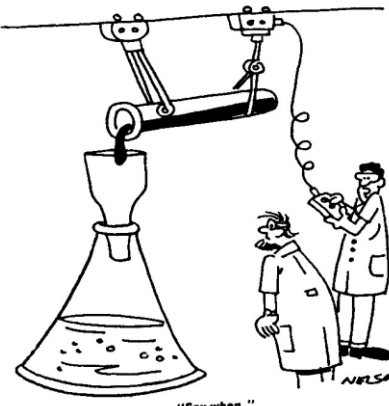


VisiMix

Mixing Simulation Software

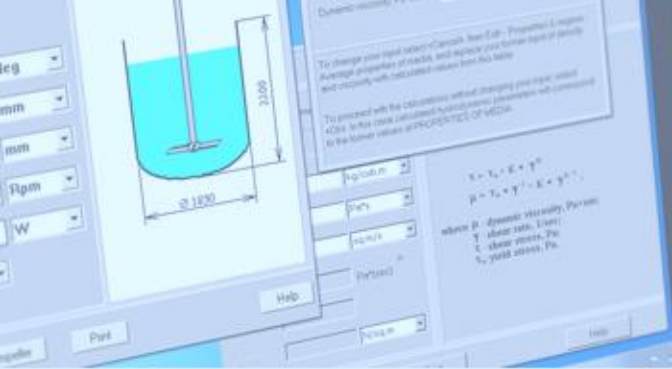
Production

QbD



20/07/2021





What is Good Mixing?

Troubleshooting in Life Science Industry

Savings of 900,000 Euro!

VISIMIX SOLUTIONS



Process: *Trouble shooting in Life Science Industry after break down of equipment*

Task: *Understand reason for failed batches and establish new operation conditions with the new equipment.*

The Process

Chemical reaction on porous beads in the life science industry.

The Problem

One product is produced in three slightly different reactors. An intermig impeller was installed in one of the reactors after a breakdown. The flow properties were much higher for batches from the reactor with the new impeller and several batches were out of specification. It was known that oxygen hydrolysis destroys the sugar molecules while the slurry is basic.

The Traditional Approach

Trial and error in the production facilities in order to do "fine tuning" of the operational parameters in the process. No improvement was observed.

The VisiMix Analysis

VisiMix was used to find out why the process failed and make suggestions to remedy the challenge.

The VisiMix Solution

Due to the design of the old impeller, all beads were found in the lower part of the reactor. VisiMix calculations showed that the improved mixing accelerated hydrolysis. VisiMix also showed that the new impeller was not suited for the process and that the only way to avoid failed batches was to stop using the vessel for this product.

The Results

Oxygen hydrolysis during basic conditions destroys the sugar molecules. Concentration of product much higher below the old impeller. Due to the improved mixing hydrolysis was accelerated.

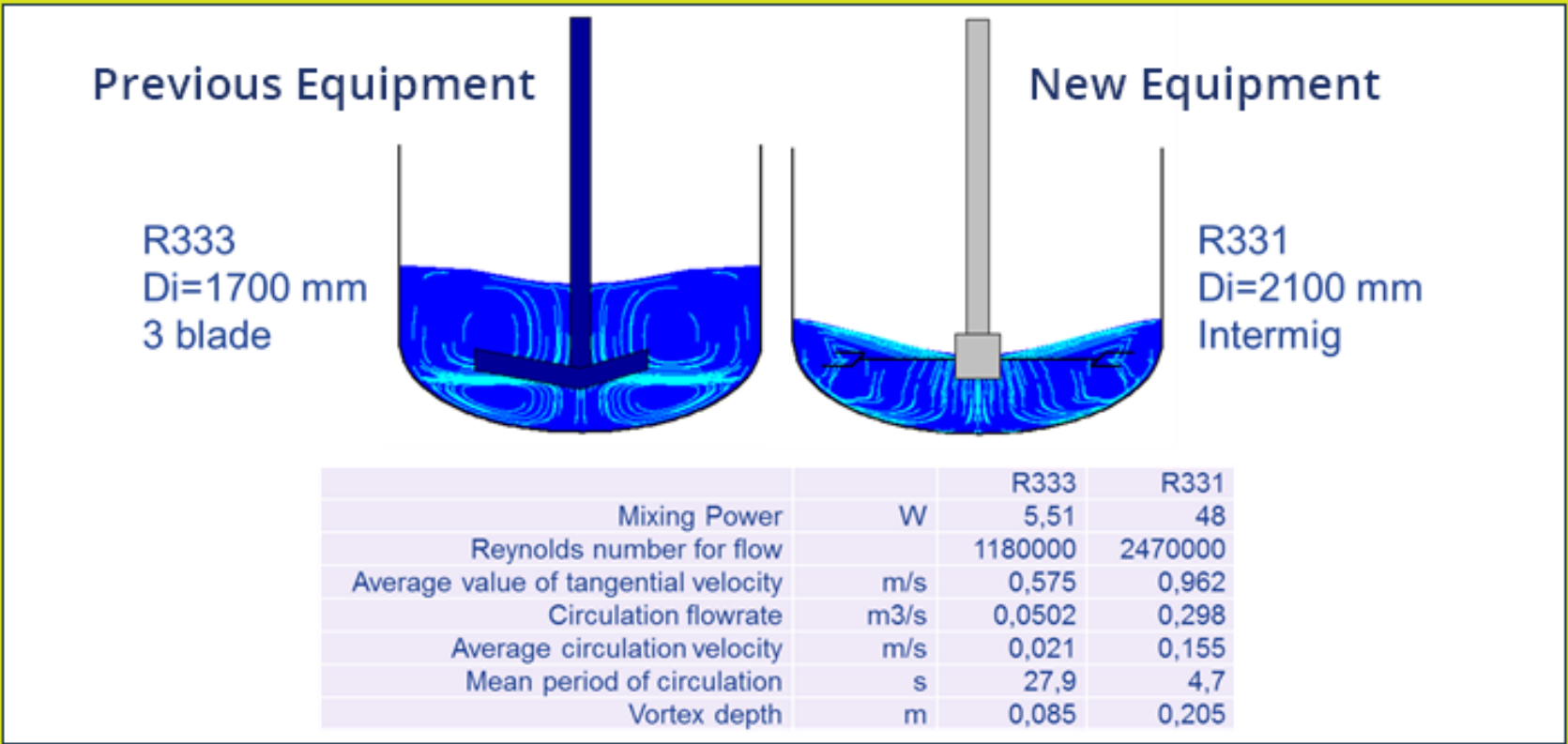
“From the outcome of this case, we understood that the combination of the company knowledge of the process with VisiMix simulation is more than must – in order to succeed to define new equipment for new processes.”

“The Launch was delayed by 6 months and the potential of production during this months is – 1,200,000 Eu and there are some more expenses connected with purchasing equipment”

Technical Description

Process :
Troubleshooting in the life science industry after breakdown and repair of equipment

Task :
Understand the reason for failed batches and establish new operation conditions with the new equipment.

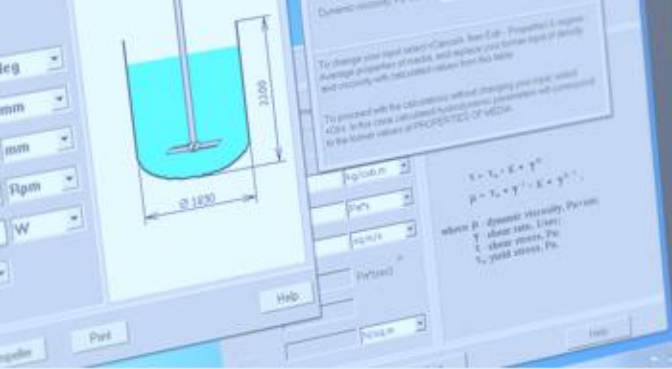


Improved mixing accelerated hydrolysis. VisiMix showed that the impeller was not suited for this process, and as a result the production was moved to reactors with appropriate mixing.



More Considerations

- ✓ Turbulent vs. Laminar regime
- ✓ Low volume in the same equipment
- ✓ Lab flow velocity vs. Impeller tip velocity.
- ✓ And many more...



Proposed Method

Mixing Calculations in Development

Save with VisiMix (for this example: \$1,000,000 per project)!

VISIMIX SOLUTIONS



Process:

Typical Fine Chemical Development

Task:

Decreasing the Number of required batches for Validation Process in the production step.

The Process

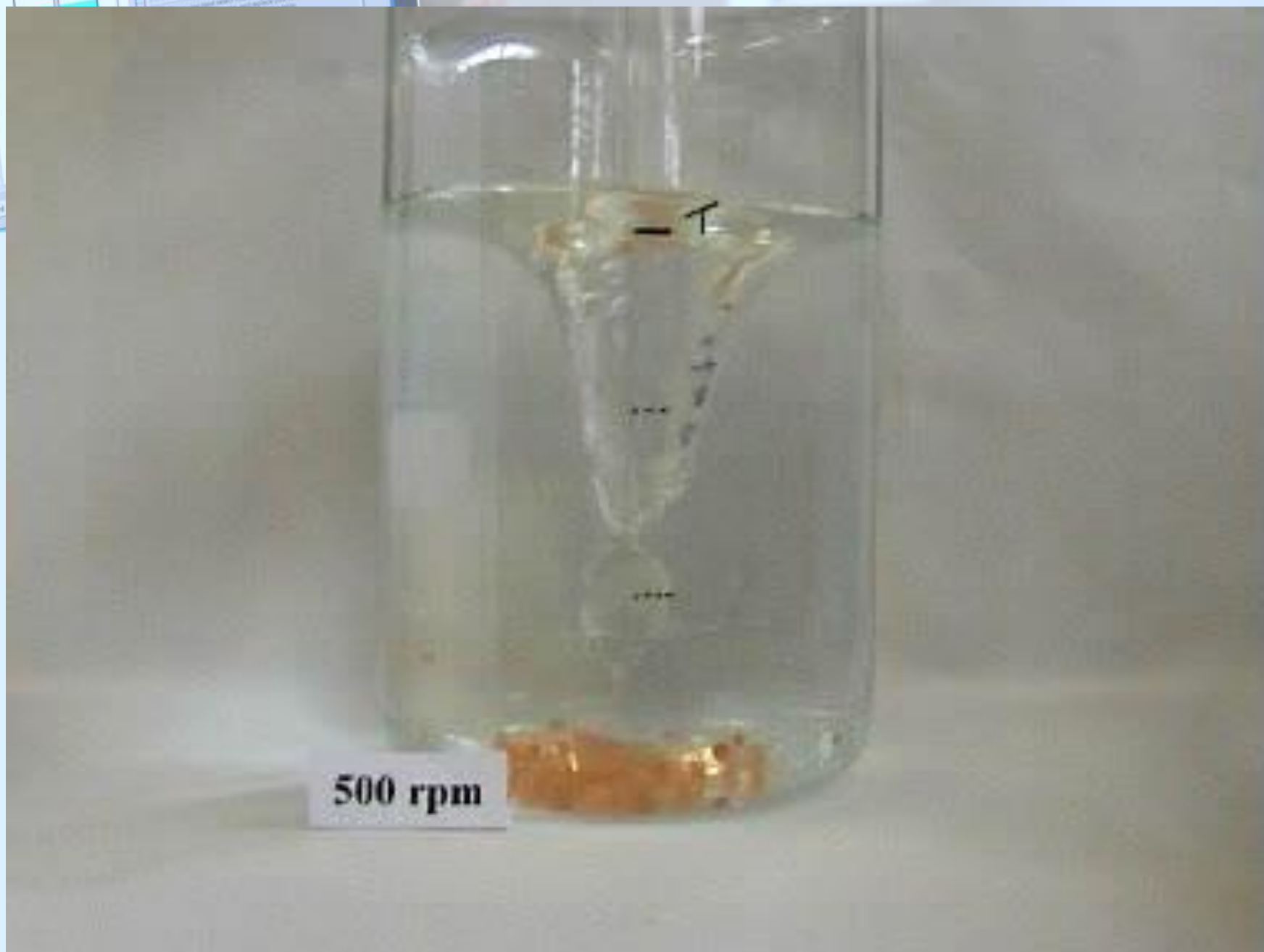
Batch and Semi batch Process.

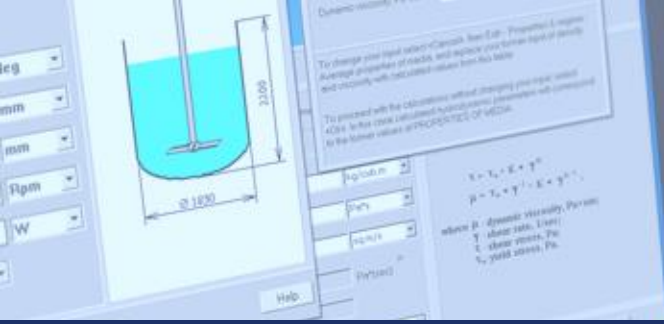
The Problem

Gap between R&D and production results.

The Traditional Approach

Running the process at increasing sized reactors and looking for optimal process and operation parameters at every stage.

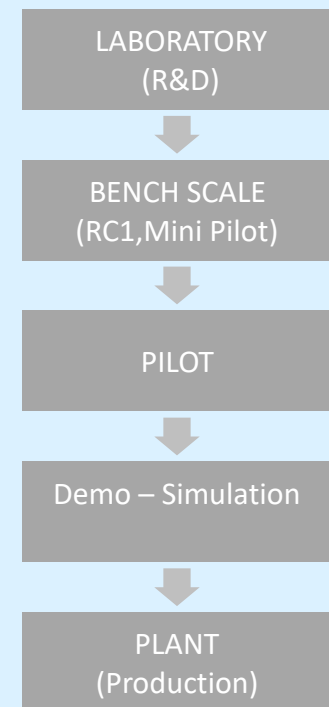
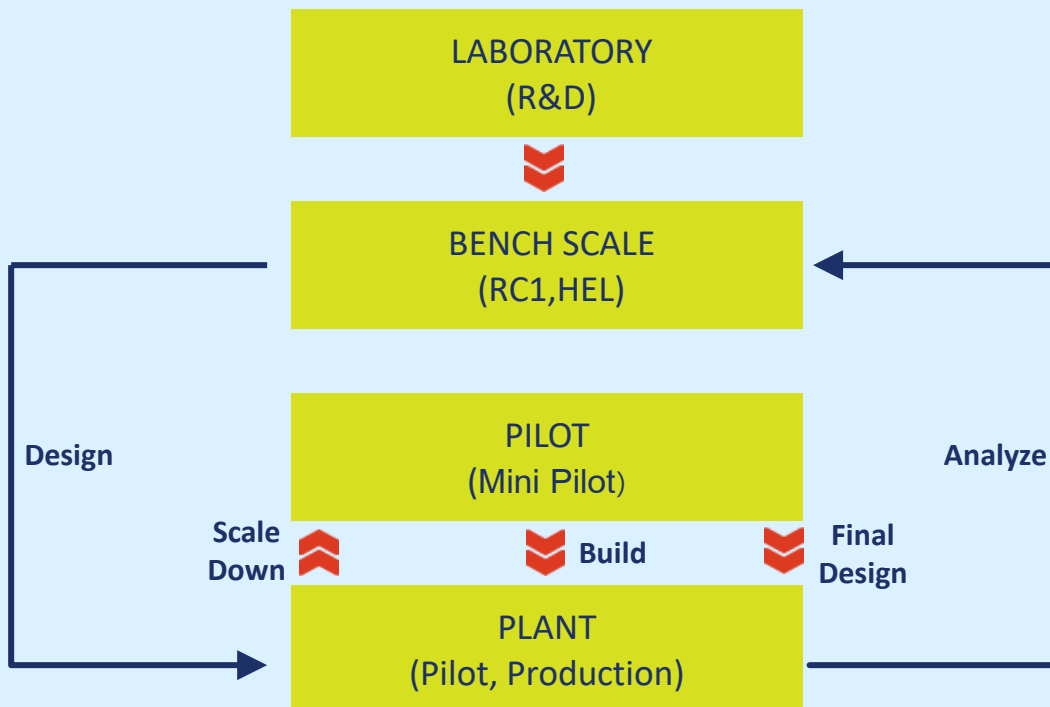




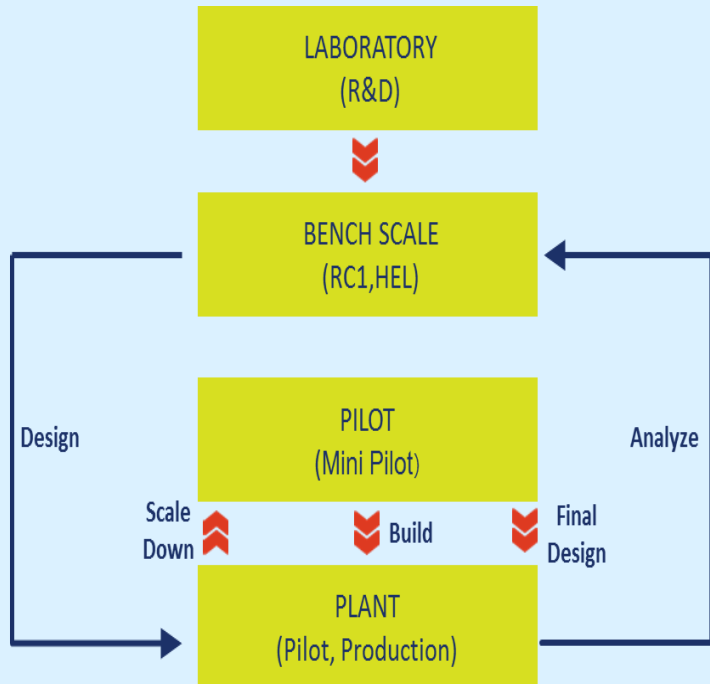
Methodology

(J.M. Berty, CEP, 1979)

New Process with Mixing



Methodology



» **Step 1:** Know the Mechanism of your Process.

» **Step 2:** Calculate Mixing Parameters will be available to provide in the commercial stage equipment.

» **Step 3:** Set Up Lab or Pilot equipment at the same range of work as calculated in Step 2.

» **Step 4:** Run Statistical Design of Experiments under conditions Set Up in Step 3 and select relevant experiments to proof the mechanism and achieved a good product quality, effective process operation and maximum yield.

» **Step 5:** Model Verification by Scaling down in industrial equipment for sample customer product.

» **Step 6:** Generate a Final Design, Procedure an Operation.

Lab and Prod Calculations

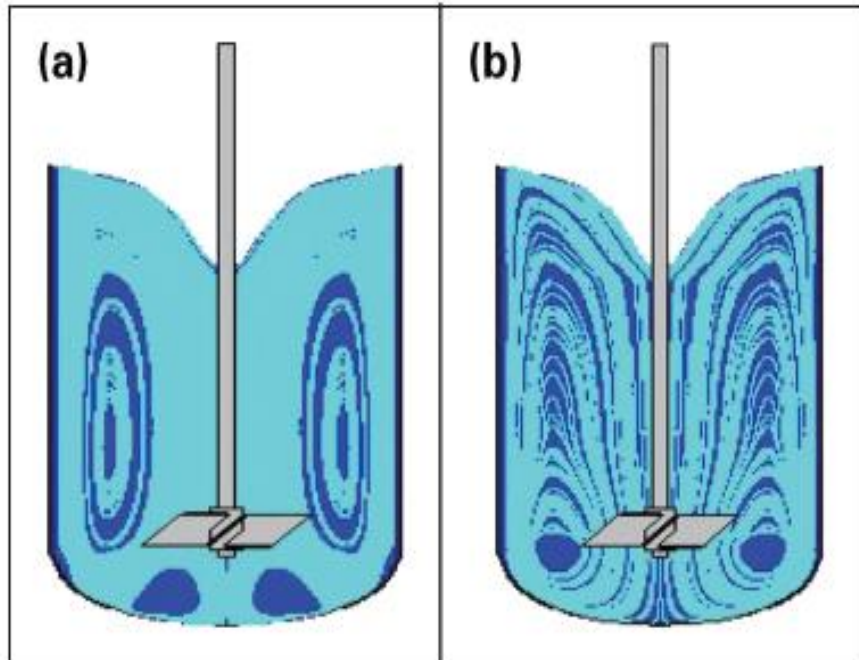


Figure 1. RC-1 General flow – pattern picture, (a) pumping down and (b) pumping up.

Operational Parameter	R 7610	R 7501 Modified
Operation Initial Conditions		
Reactor Volume, L	8	100
Reactor Temperature, °C	70	70
Stirrer Velocity, rpm	450	300
Hydrodynamics		
Mixing Power, W	17	335
Reynolds for Flow	73200	249000
Turbulence Main Characteristics		
Energy Dissipation – Average value, W/kg	2.29	3.61
Energy Dissipation – Maximum Value, W/kg	103	122
Liquid-Solid Mixing Main Characteristics		
Solid Suspended Condition is Expected	OK	OK
Maximum Degree of Non-Uniformity – Axial, %	14	15
Maximum Degree of Non-Uniformity – Radial, %	5	4
Average Concentration of Solid Phase in Continuous Flow, kg/m ³	39	39
Gassing Characterization		
Gas Hold – Up*	0.00024	0.16
Specific Mass Transfer Coefficient Gas – Liquid, 1/s	0.0015	0.655
Gas Mass Transfer Rate*, kg/h	0.0011	6.84
Gas Distribution: Satisfactory, Flooding Not Expected	OK	OK
* Gas Hold-up: represents the average value of volume fraction of gas in the gas-liquid mixture. * Gas Mass Transfer Rate: rate of gas dissolution corresponding to specific mass transfer coefficient.		

Non Ideal Stirring – Non homogeneity

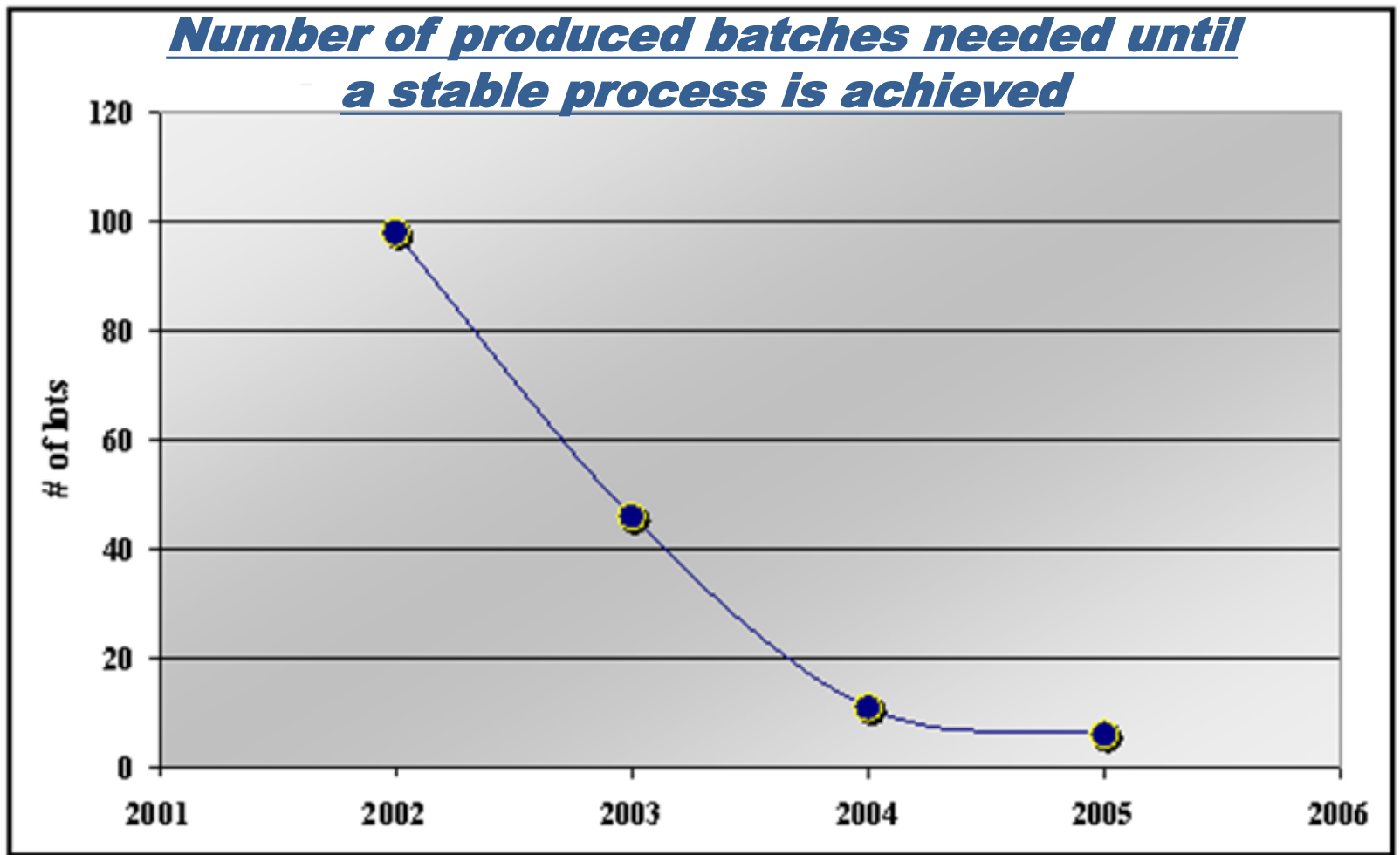
Before performance of scale up experiments **VisiMix** simulation was used to check suspension at different Mini Pilot Reactors:

Reactor	7603	7605	7605	7607
Volume, L	10	25	25	50
RPM	500 (Max)	400	500 (Max)	150 (Max)
Liquid – Solid Mixing				
Solid suspension quality	Complete suspension is questionable. Partial settling of solid phase may occur.	Complete suspension is expected.	Complete suspension is expected.	Complete suspension is questionable. Partial settling of solid phase may occur.
Max. degree of non uniformity of solid distribution				
AXIAL, %	22.3	10.3	29.1	132
RADIAL, %	65.7	34.3	76.3	90.8

Not all Mini Pilot reactor are capable of full suspension of Reagent

Methodology

Number of produced batches needed until a stable process is achieved



VisiMix Certificate





Purpose

- ✓ Our newest feature, the VisiMix Certificate, will be a testament to your mastery of the VisiMix software.
- ✓ During the webinar, we'll show you how the system works and how you can earn the Certificate.



Instruction

<https://training.visimix.com/>

- ✓ In this page you will find 7 tests, each test of different unit operation, after you'll answer all of them correctly VisiMix certificate will be sent to your email.
- ✓ In order to answer VisiMix tests you will need VisiMix software installed on your computer.
- ✓ Please notes:
 - 1.VisiMix recommend working on the SV example before solving the VisiMix certificate tests (<https://visimix.com/wp-content/uploads/2016/04/S1.pdf>)
 - 2.We are assuming while taking the test, data will be changed by the user as VisiMix software Attention recommending

Instruction



Single Phase Liquid Mixing

7 questions



Batch chemical reaction

4 questions



LIQUID – LIQUID MIXING – EMULSIFICATION

5 questions



LIQUID – SOLID MIXING. DEFINING JSS (JUST SUSPENSION SPEED)

4 questions



GAS – LIQUID MIXING. FERMENTATION

9 questions



Heat transfer, Fixed temperature regime

3 questions



Heat transfer, SEMI BATCH

5 questions

Instruction

1. [Log in](#) to your personal area.
2. Answer one test at a time (the order has no significance).
3. At the end of each test, you'll be asked to upload the relevant VisiMix file
4. Be aware that every successful test will be locked and save, you will not have access to the test.
5. Each test you'll answer correctly will change his color to green.
6. Each test you'll answer partly or incorrectly will change his color to red.
7. Your answer will be saved and would be able to log in later in order to complete the tests.
8. After completing correctly all the tests, click 'submit' button
9. For question or technical issues please write to us at: roberton@visimix.com



Example Test

VisiMix Certificate- Single Phase Liquid Mixing

VisiMix Turbulent for mathematical modeling of turbulent mixing in reactor with 2-stage Lightnin impeller.

Problem description:

You will obtain some general data on your mixing equipment, which will enable you to evaluate the general suitability of your equipment, compare different designs, etc. These parameters are used as basic data for calculations of other mixing problems.

Initial data

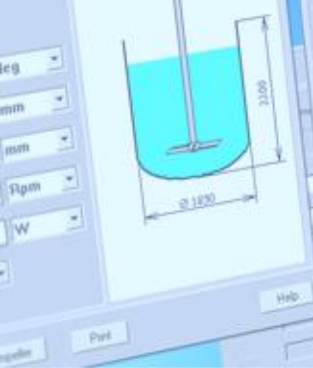
Tank Flat bottom:

Inside diameter = 3000 mm

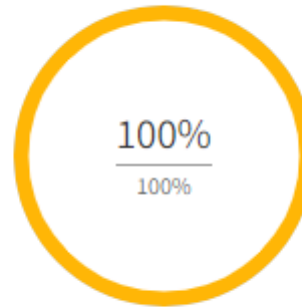
Total volume = 35 cub.m

Volume of media = 30 cub.m

» [1-Single phase liquid mixing - no answers.docx](#)



Single Phase Liquid Mixing

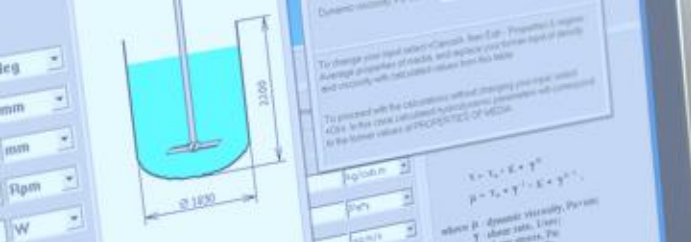


Passed ✓

Time spend	00:02:21
Point	7 / 7
Questions	7
Correct	7
Wrong	0
Skipped	0

Last Attempted

Questions	Time spend	Marks	Passing grade	Result
0 / 7	00:00:49	0 / 7	100%	0.00%



Certificate of Completion

Awarded to

YOU

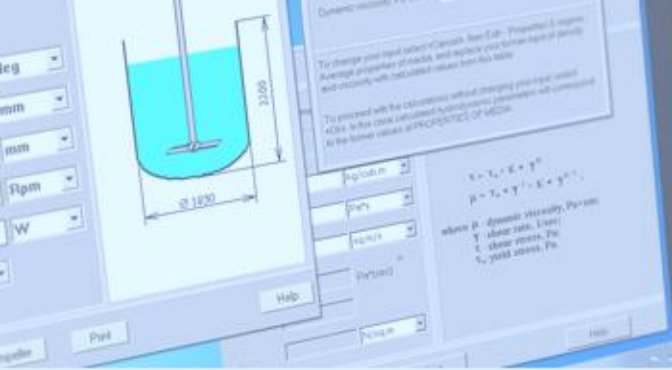
*For the successful completion of
The VisiMix Basic Training Course*

Gad Amir

Date

Gad Amir, [VisiMix CEO](#)





VisiMix Application

Crystallization

Mixing Parameters for Crystallization Processes

IMPORTANT PARAMETERS	ANSWERED QUESTIONS AND NOTES
Axial and radial solids uniformity (distribution)	What is the uniformity throughout the vessel? Ensure that solids do not accumulate on the bottom.
Micromixing time	How long is the micro scale degradation of non-homogenized concentration? This is important for precipitations.
Energy of collisions in bulk	What is the collision energy of particles? A high number of collisions in the bulk can affect breakage and secondary nucleation.
Collisions of maximum energy	How often do the slurry particles see the maximum collision energy? What is the frequency near the zone of maximum turbulence near the impeller blades? Frequent collisions lead to more breakage and secondary nucleation.
Local values of energy dissipation	What is the average energy dissipation in the agitator zone? What is in the bulk slurry? What is it at the baffles? Dissipation controls breakage, nucleation and micromixing in these zones.
Maximum energy dissipation	Manipulating energy dissipation in the area behind the agitator blades controls breakage, nucleation and micromixing in this zone.
Time between strong collisions	What is the average period of uninterrupted crystal growth?
Shear rates	What is the likelihood of rupturing the crystal or agglomerates? What is the impact on growth and desolution for the agitation conditions?

Mixing Parameters for Crystallization Processes

Cooling crystallization of API in 6000 liter reactor.

Campaign	$X(v,90) < 250 \mu m$
First	195
Second	325

After investigation it was found that the tip diameter of the Agitator was damaged and the real diameter is a 80 % of the reported one.

ENERGY DISSIPATION - MAXIMUM VALUE

Parameter name	Units	Value
Energy dissipation - maximum value	W/kg	191

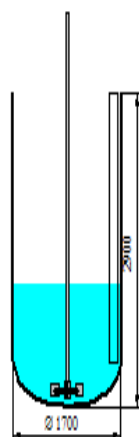
For HELP press F1

ENERGY DISSIPATION - MAXIMUM VALUE

Parameter name	Units	Value
Energy dissipation - maximum value	W/kg	115

For HELP press F1

[VisiMix_R3107] - Drawing of apparatus



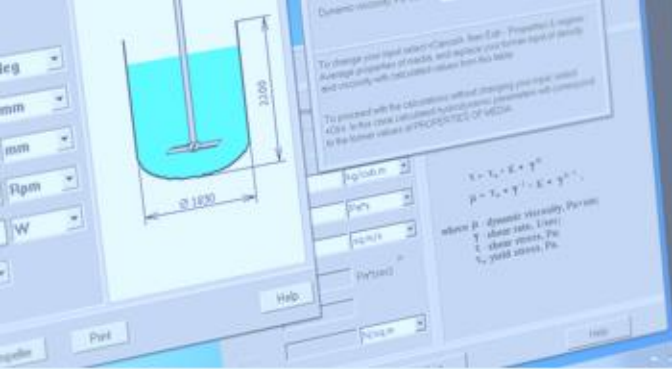
For HELP press F1

[VisiMix_R3107-new] - Drawing of apparatus



Volume 

For HELP press F1

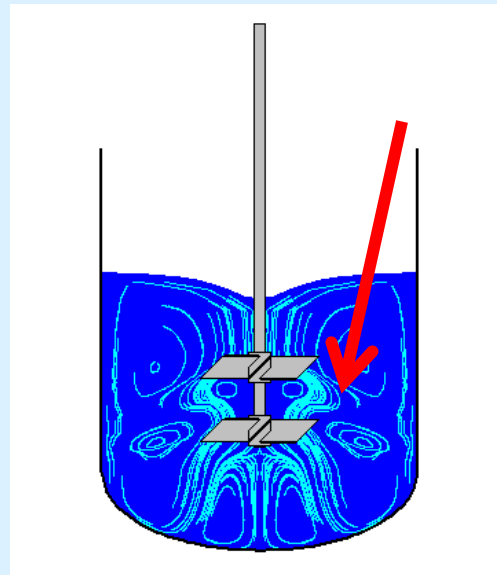
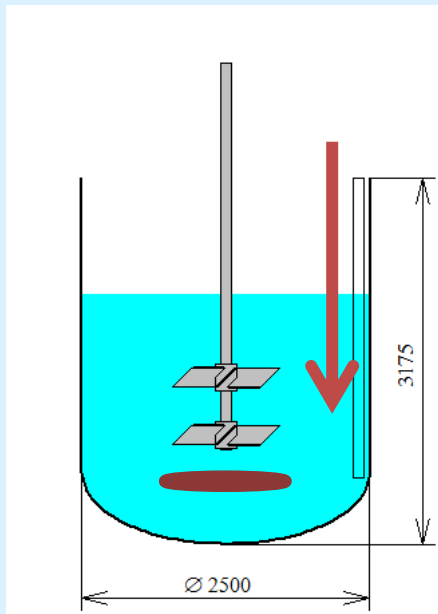


VisiMix Application

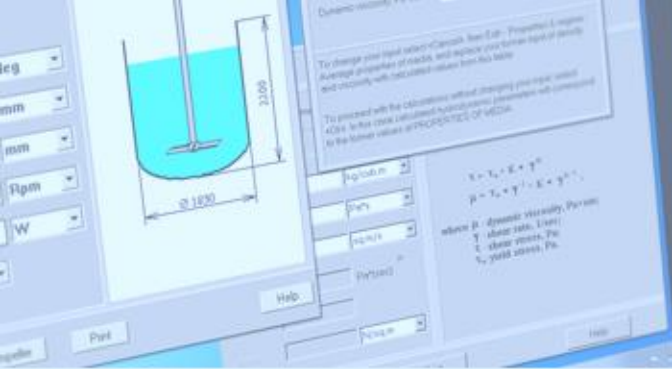
Gas Liquid Reaction

Description

- Gas – Liquid reaction in pilot scale ~ 1000 liter is finished after 4 Hour
- Same in Production 4 Days.



After Change
Position the
process take
around **14 hours**

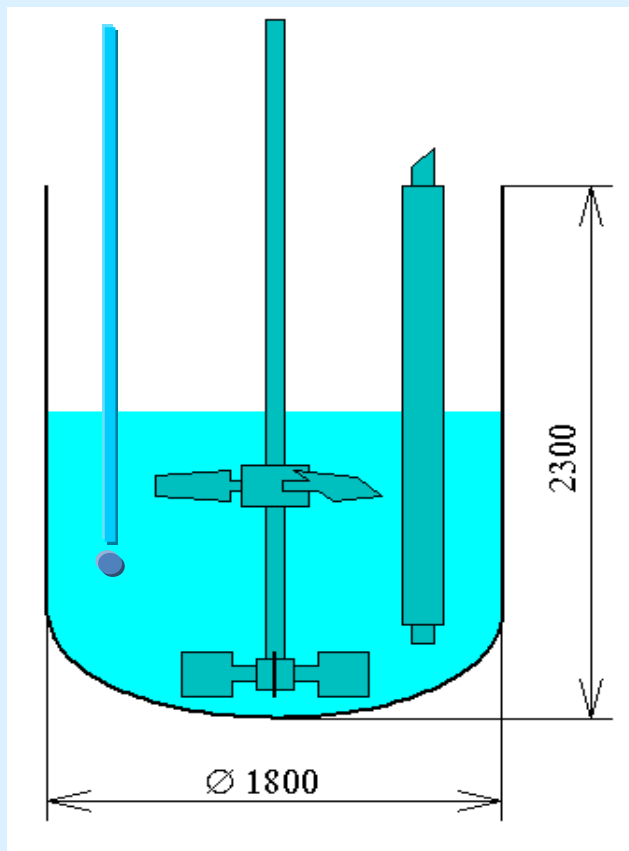


VisiMix Application

High Shear Rate in Semi Batch Homogeneous Reaction

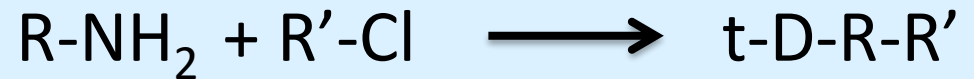
Process and Quality Problem

Feed R-Cl



R-6826

Process

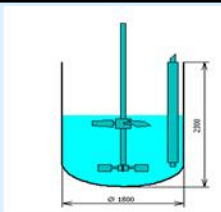


Impurity

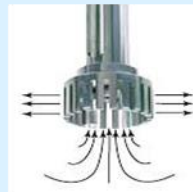


Impurity Results at Laboratory and Production

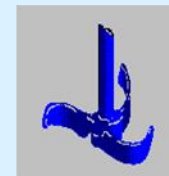
[%]impurity	RPM	Impeller type	system
0%	15,000 rpm	rotor stator	Laboratory reactor
0.3%	1,500 rpm	3-blade	
0.6%	800 rpm		
1.5%	100 rpm		
0.3% - 0.6%	140 rpm	bottom – flat blade up - turbofoil	R-6826



R-6826



Rotor stator



Lab impeller

Working with Rotor Stator at Laboratory Scale

Problem

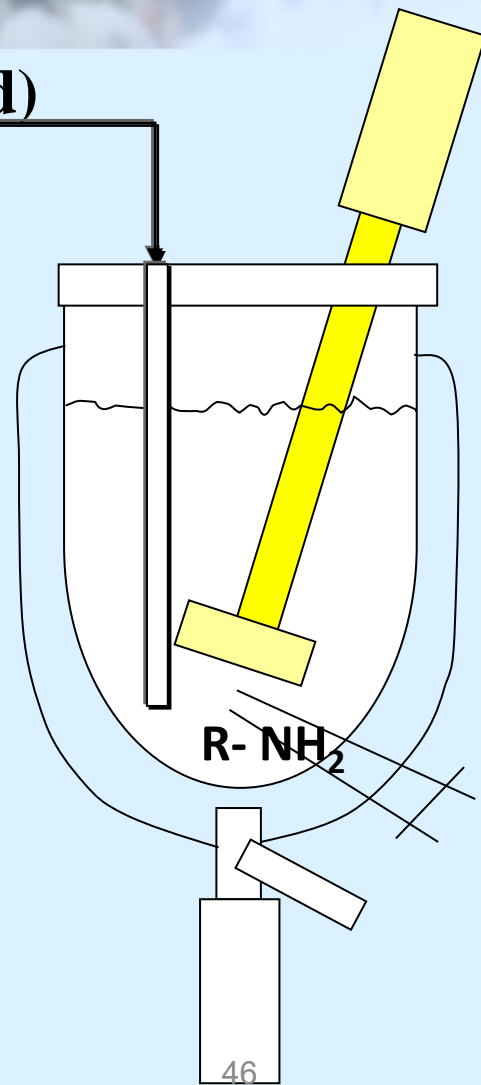
How to scale up ?

Potential Saving :

MORE than 250 K\$

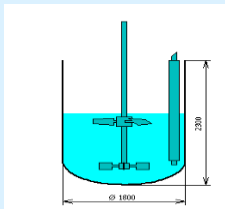


$R'-Cl$ (liquid)

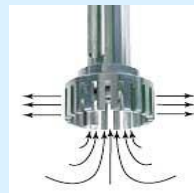


Calculating Shear Forces with VisiMix

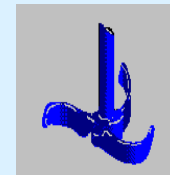
Turbulent shear rate [1/s]	[%]impurity	RPM	Impeller type	system
780,000	0%	15,000 rpm	rotor stator	Laboratory reactor
32,900	0.3%	1,500 rpm	3-blade	
12,900	0.6%	800 rpm		
580	1.5%	100 rpm		
15,200	0.3% - 0.6%	140 rpm	bottom – flat blade up - turbofoil	R-6826



R-6826



Rotor stator



Lab impeller

VisiMix Products

VisiMix software:

- Based on advanced scientific knowledge and practical expertise
- User-friendly and easy to operate
- Requires easily accessible initial data

The VisiMix products are:

- | | |
|-----------------------------------|----------------------------|
| ➤ VisiMix 2K8 Turbulent | ➤ Rotor Stator Disperser |
| ➤ VisiMix 2K8 Laminar | Emulsification – RSDE |
| ➤ VisiMix 2K8 Different-Impellers | ➤ 3D VisiMix Visualization |
| ➤ VisiXcel- Data Base | ➤ VisiMix Off Center |
| ➤ Pipe Line | ➤ VisiMix Bubble Columns |
| | ➤ Scale Up/down |
| | ➤ Process Evaluation |

VisiMix Products

VisiMix 2K8 Turbulent – for **low-viscosity** liquids and multiphase systems.

The program provides process parameters necessary for analysis, scaling-up and optimization of mixing tanks and reactors with all types of impellers

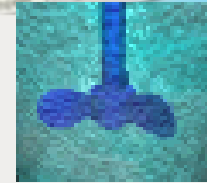
Calculations of:

- ✓ Blending
- ✓ Suspension
- ✓ Dissolution
- ✓ Emulsification
- ✓ Gas dispersion
- ✓ Heat transfer
- ✓ Chemical reactions
- ✓ Mechanical stability of shafts

VisiMix Products

VisiMix *2K8 Laminar* - for highly viscous media

- ✓ Newtonian and non-Newtonian
 - ✓ Macro-scale blending
 - ✓ Micromixing in high-shear areas
 - ✓ Heat transfer
- pastes
 - creams
 - shampoos
 - liquid soaps
 - gels
 - ointments
 - paints:
 - coatings
 - slurries
 - polymer solutions



VisiMix Products

VisiMix 2K8 Different Impellers – for combined mixing devices

- The program handles mixing devices consisting of any 2 – 5 impellers.
- Different distances between impellers
- Used in combination with VisiMix Turbulent.
- Provides parameters of hydrodynamics, turbulence and heat transfer.

VisiMix Products

VisiMix VisiXcel – Data Base (DB) – automatic conversion tool:
Visimix Output to Excel Spreadsheet

- ✓ Integrates VisiMix report parameters in standard Excel worksheets
- ✓ Analysis VisiMix results in Excel
- ✓ Builds a Database of mixing tanks and reactors.
- ✓ Builds a Database of projects - for processes
- ✓ Makes correlation between plant equipment nomenclature to VisiMix database of mixing tanks and reactors in VisiMix Project Database.
- ✓ Easy access to design data of the mixing tanks, to process parameters and to corresponding results of VisiMix modelling.
- ✓ Results of VisiMix mathematical modelling in the **VisiMix VisiXcel-DB** and arrange the data according to the reactor nomenclature.
- ✓ Easy access to recalculation of the VisiMix modelling from the Database of the reactors & the projects

VisiMix Products

VisiMix Pipe-Line



- ✓ Calculates hydraulic resistance of simple pipelines for liquid viscosity and non-Newtonian products.
- ✓ *Chemical engineers benefit from a quick and user friendly method for charging times and the bottle-necks in the line.*
- ✓ **Includes :** - Pipes - Riffled hoses – Elbows – Valves - And more
- ✓ Also comes with a **database containing rheological constants** for the typical commercial non-Newtonian products - pastes, creams, shampoos, paints, etc. (see **Help Section for details**)
- ✓ *The **first and only tool** calculating flow resistance for liquids that correspond to **Carreau rheological model**. (See Help Section for details)*

VisiMix Products

VisiMix RSDE (Rotor Stator Disperser Emulsification)

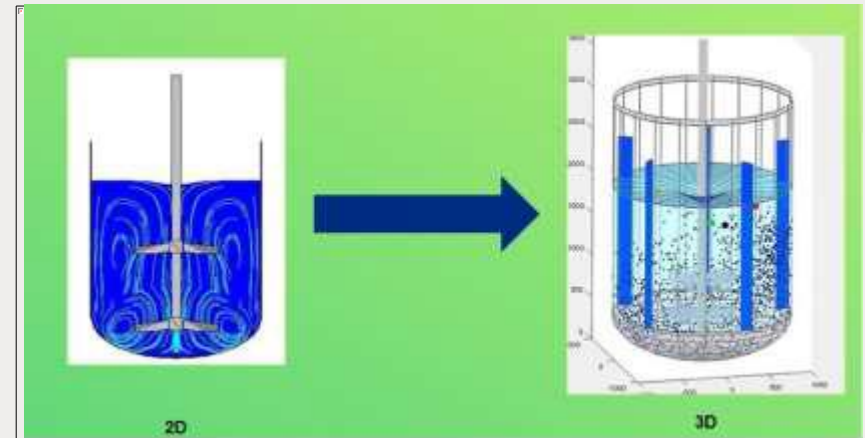
- ✓ The revolutionary new VisiMix RSDE - Rotor Stator Disperser Emulsification software is the first product of its kind that provides support for mixing devices for media subjected to high shear stress:
Based on 3 years dedicated research in a lab with dedicated equipment
Works with all types of media - both high and low viscosity liquids, Newtonian and Non-Newtonian.
- ✓ Input geometrical data and process parameters and obtain fast and reliable results with one click
- ✓ VisiMix RSDE enables you to quickly calculate
 - Shear rates and stresses in internal spaces
 - Pumping capacities
 - Power consumption and torque

NEW!

VisiMix New Version

3D Visualization of Mixing, Based on the Hydrodynamic Model of the Flow Pattern.

- ✓ This is an exciting 3D visualization based on the VisiMix calculations
- ✓ Grasp the VisiMix results much better.
- ✓ The VisiMix process now looks alive.
- ✓ It is much easier to understand and explain VisiMix results to others and to management.



NEW!

VisiMix New Version



Alternative Impellers

- ✓ Now anyone from your professional can use VisiMix for the entire range of impeller geometries and can now be studied for **known power and flow numbers**.

ALTERNATIVE IMPELLER. SCHEME IS SYMBOLIC.

Tip diameter (D)

900

mm

Number of blades

3

INPUT OPTIONS

Np - Power Number &
Nq - Circulation Flow Number



Np - Power Number &
Tip Pitch Angle of Blades



Power number Np

0.182

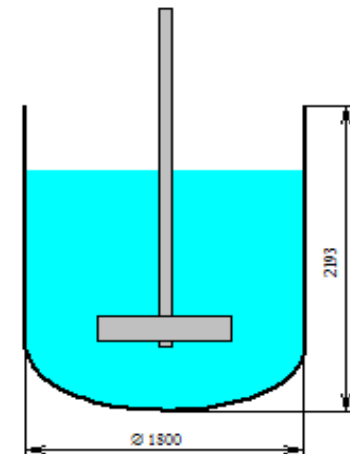
Circulation flow number Nq

0.584

Tip pitch angle of blades

deg

Np and Nq - values based on experimental measurements in water in a fully baffled tank with $H/T = 1$ and $T/D = 3$.
Here T - tank diameter, H - level of liquid, D - tip diameter of impeller.



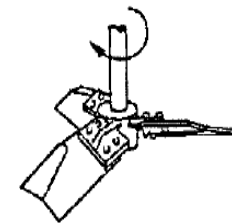
Hydrofoil Impellers

A New Option of Selecting Hydrofoil Impellers from Different Manufacturers

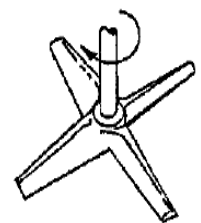
- ✓ Provide streamlined flow as compared to axial imp's
- ✓ Give low shear but more uniform velocity
- ✓ Results in lower power consumption
- ✓ Used mainly for blending of miscible liquids, suspensions of solids and gas-liquid, liquid-liquid mixing



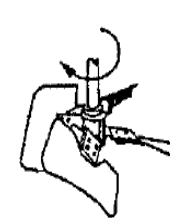
Lightnin A310



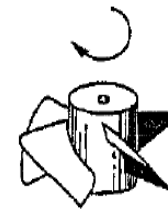
Chemineer HE3



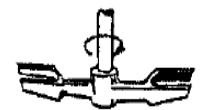
EMI Rotofoil



Lightnin A315

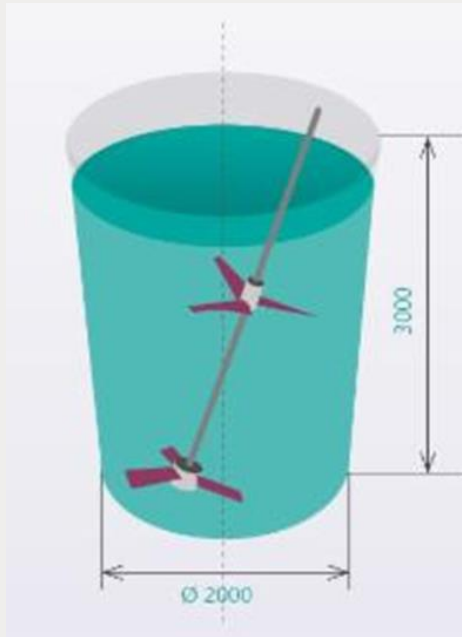


Prochem Maxflo



Ekato INTERPROP

2019 - VisiMix Off Center Impellers



**New
Release!!**

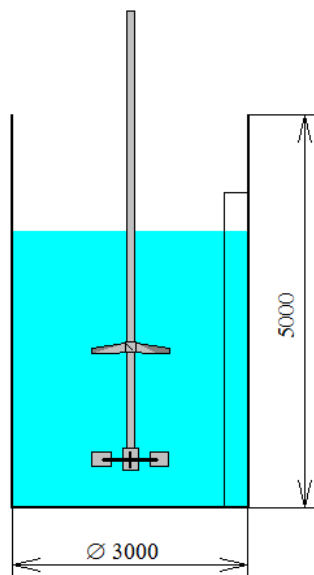
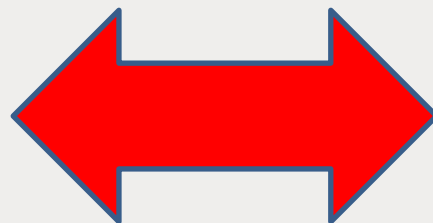
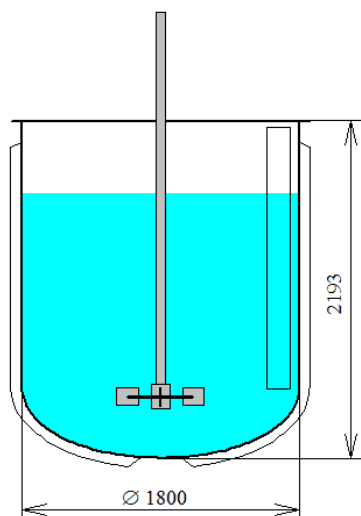
Special
price for
participants

VisiMix

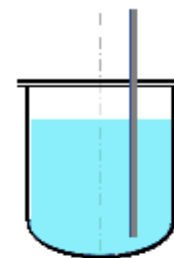


Visimix.Ltd

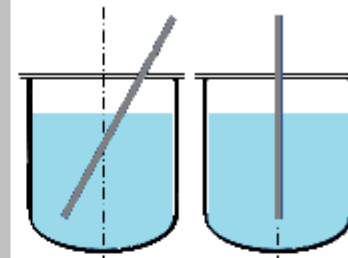
Off Center Impeller Options



SCHEME TYPES

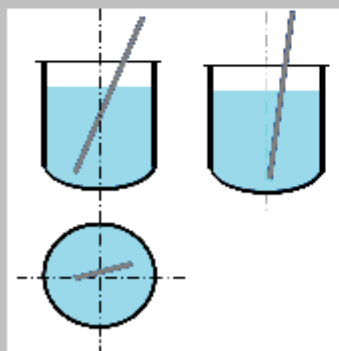


Off-center vertical shaft

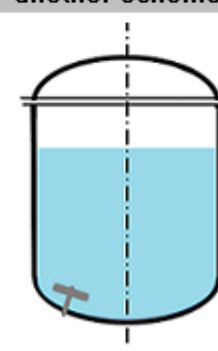


Shaft inclined in one plane

FOR ELLIPTICAL BOTTOM ONLY!
For flat/conic bottom select another scheme.



Shaft inclined in two planes



Bottom entrance of shaft

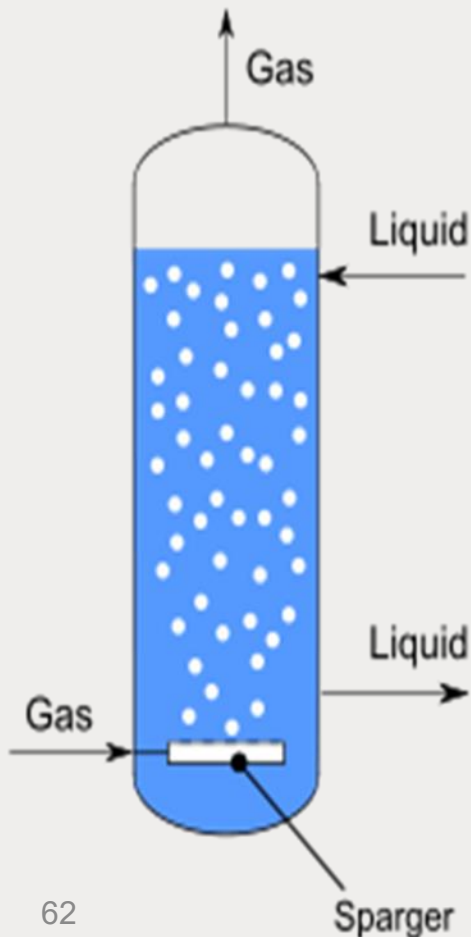
VisiMix Off Center Impellers

- The first release of the program allows for entering of mixing devices with :
 - one or two impellers (identical or different)
 - vertical and inclined head-entering shafts
 - bottom-entering mixing devices with single impeller.
- The program outputs include
 - main parameters of hydrodynamics (power, flow velocities, etc.)
 - turbulence (maximum and other local values, etc.)
 - heat transfer corresponding

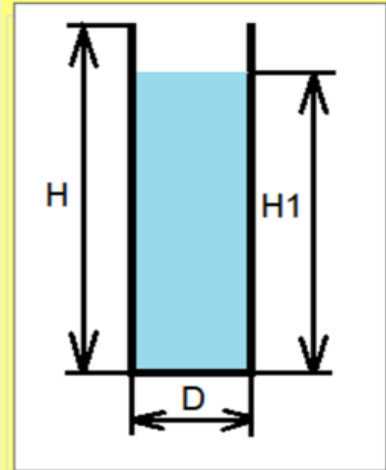
2020 - VisiMix Bubble Columns

End of April 2020! Follow our Future Announcement!

**New
Release!!**



Visimix.Ltd



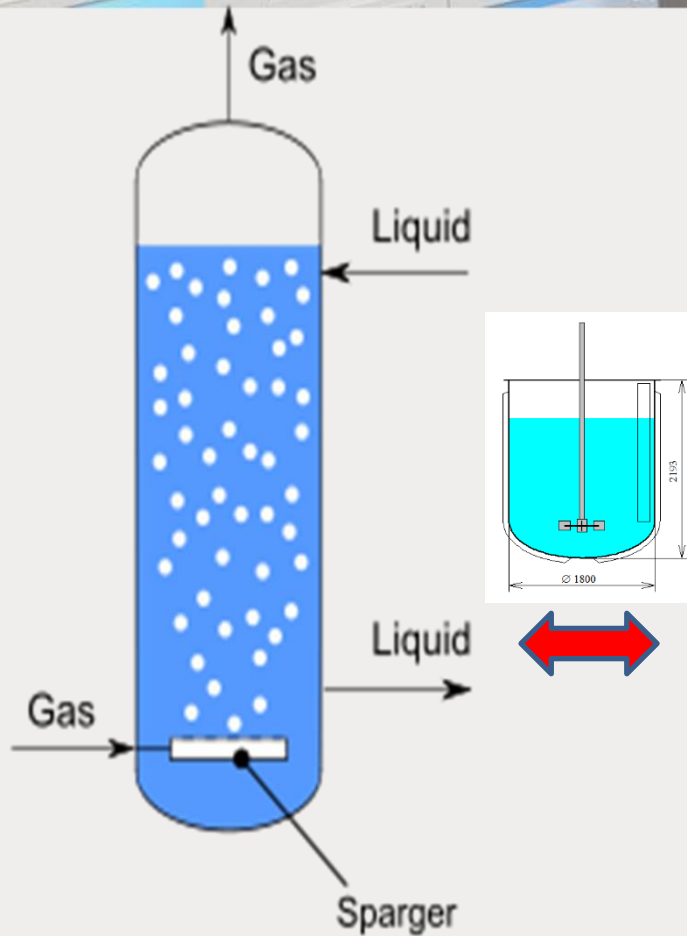
Column Diameter (D) , m	1300
Total Column Hight (H) , m	3200
Liquid Depth (H1) , m	2800
Gas Flow Rate , qub.m/s	5

Calculate

Print

Exit

Bubble Columns Interphase



Prepare Visimix Input Data for Heat Transfer Calculations in Bubble Columns

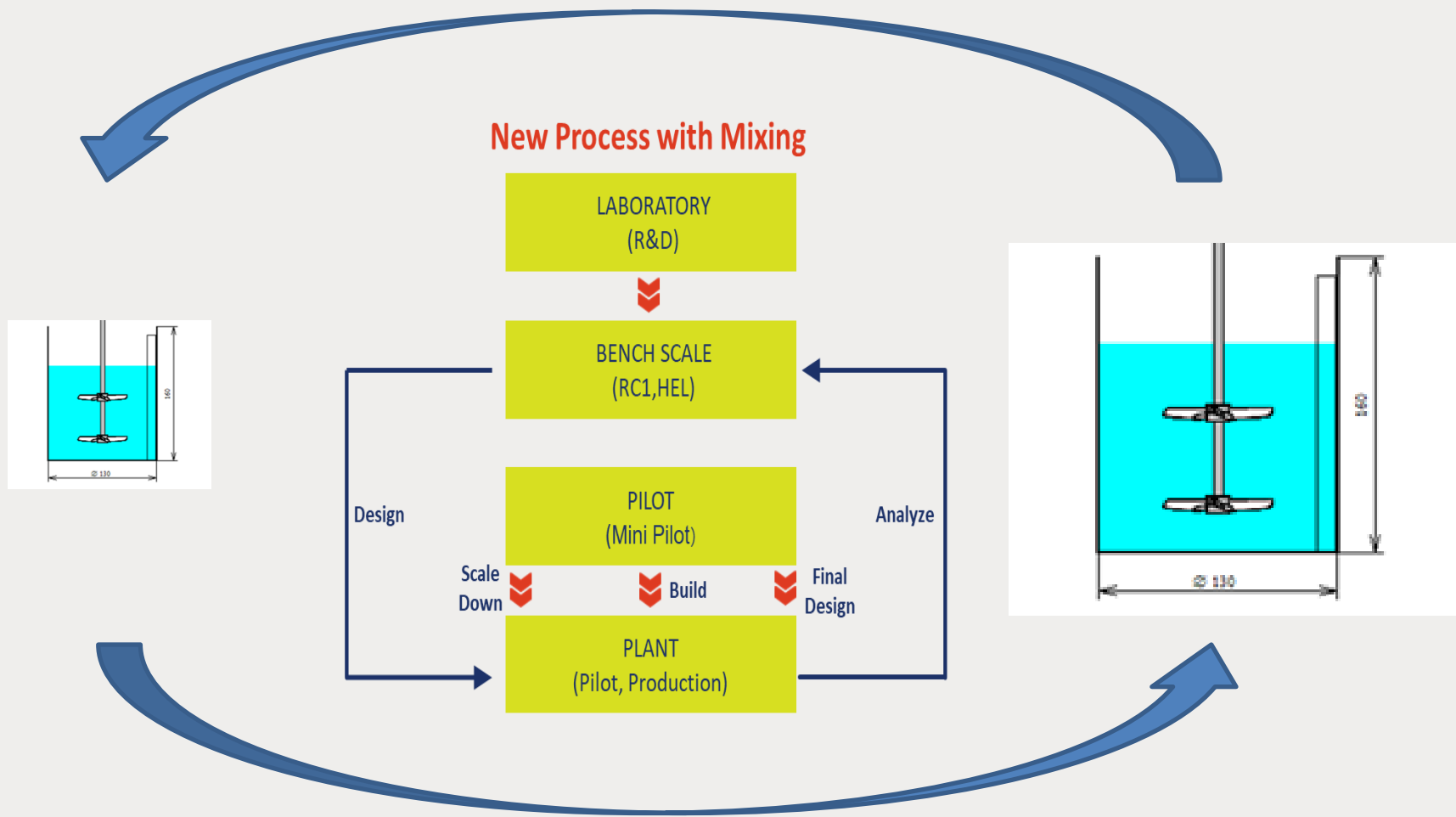
Jacketed Tank with Flat Bottom		Impeller PITCH PADDLE. MULTISTAGE	
Inside diameter, m	1300	Tip diameter(D), m	650
Total tank height, m	3200	Impellers number	3
Level of media, m	2800	Dist. between stages, m	560
FLAT BAFFLE-1		Number of blades	
Number	4	3	
Width, m	130	Pitch angle, deg	
Length, m	2800	30	
Dist. from bottom	0	Width of blade, m	
Angle to radius (fi)	0	65	
Dist. from bottom		Dist. from bottom, m	
0		560	
Rotation speed, rpm		Motor power, kw	
0.06284		3.998E+05	
Circulation Flow, qub.m/s		Near Wall Velocity, m/s	
2.652E+05		0.3996	

Column Dimensions	
Column Diameter (D) , m	1300
Total Column Height (H) , m	3200
Liquid Depth (H1) , m	2800
Gas Flow Rate , qub.m/s	5

Calculate

Print Exit

VisiMix Scale Up/Down



VisiMix Scale Up/Down

SCALE UP / DOWN

Tank size	Prototype	Target
Tank volume, cub.m	15.2	0.00100
Tank diameter, mm	2440	98
Rotation speed, rpm	75	639
Main mixing parameters	Visimix results	Estimate
Impeller tip velocity, m/s	5.11	1.70
Average energy dissipation rate, W/kg	0.189	0.190
Maximum local energy dissipation rate, W/kg	11.3	11
Turbulent shear rate near the impeller blades, 1/s	3370	3400
Mixing time, s	26.8	3.20
Characteristic time of micromixing, s	2.89	2.90
Impeller Reynolds number	2.11e+01	29000

Scale up/down similarity variables
(key mixing parameters to be reproduced)

☐ Impeller tip velocity
☒ Average energy dissipation rate
☐ Maximum local energy dissipation rate
☐ Maximum shear rate
☐ Mixing time
☐ Micro-mixing time
☐ Impeller Reynolds number
☐ Enter target rotation speed, rpm

Key process characteristic to be reproduced

Pick-up of particles. Liquid-solid mixing

Pick-up of particles. Liquid-solid mixing
 Suspension axial distribution. Liquid-solid mixing
 Mass transfer rate. Liquid-solid mass transfer
 Mean drop size. Liquid-liquid mixing
 Emulsion specific surface. Liquid-liquid mixing
 Complete emulsifying
 Mass transfer rate. Gas-liquid mixing
 Gas pick-up on surface. Liquid-liquid mixing
 Distribution of reactants. Single phase reaction
 By-product formation. Single phase reactions

Random upward turbulent fluctuations of sufficiently high intensity pick-up solids by offsetting their gravitational settling to the tank bottom and preventing accumulation of solids there.

To scale solids pick-up, the program

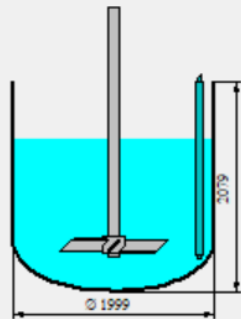
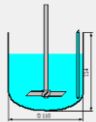
- maintains geometric similarity of tank hardware dimensions and the same relevant physical properties and process characteristics, selects liquid depth proportional to tank size, and

- selects impeller rpm to maintain the same intensity of turbulent fluctuations by keeping either

- * the same mean energy dissipation rate for a BAFFLED TANK, or

- * the same impeller tip velocity

VisiMix Process Evaluation



Unit operation: **Suspension of Solid Particles**

Open Save As Export to Excel Close Exit

1 C:\Users\Moshe Bentolila\Desktop\lab VSM
2 C:\Users\Moshe Bentolila\Desktop\Production 1.vsm
3 C:\Users\Moshe Bentolila\Desktop\Production 2.vsm
4 C:\Users\Moshe Bentolila\Desktop\Production 3 VSM

Target parameters

Parameter	1	2	3	4	5	6
Project Name	lab	Production 1	Production 2	Productio...		
=== TARGET PARAMETERS						
Complete/incomplete suspension	complete	incomplete	complete	incomplete		
Maximum degree of non-uniformity, axial, %	24.1	24.2	23.4	21.9		
Maximum degree of non-uniformity, radial, %	42.5	13.3	12.7	0.34		
Maximum local concentration of solid phase, kg/cub.m	138	130	129	124		
Minimum local concentration of solid phase, kg/cub.m	44.7	67.3	68.4	79.2		
Average concentration of solid phase in continuous flow, ...	138	130	129	124		
Frequency of collisions of maximum energy, 1/s	0.0698	0.0272	0.0271	0.00233		
=== BASIC DEVICE CHARACTERISTICS						
Tank diameter, mm	110	1800	2000	1800		
Type of impeller	pitched paddle	pitched paddle	pitched paddle	Lightnin A310		
Impeller tip diameter, mm	60	982	1090	900		
Impellers number	1	1	1	1		
Maximum energy of collisions, J	2.89e-12	4.38e-13	4.36e-13	1.37e-12		
Presence of baffles	YES	YES	YES	YES		

Brief description of the application

1. General

This application presents results of VisiMix simulations of selected unit operation for a number of VisiMix projects that differ from each other by equipment design, scale or process regime.

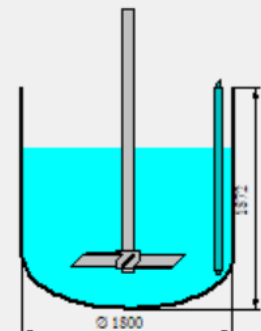
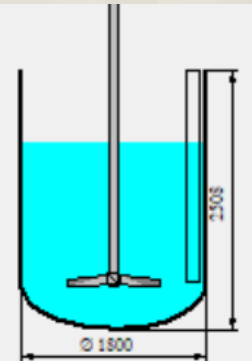
This comparison is performed with respect to unit operation (technical target of the mixing operation defined by user).

Results of different VisiMix projects comparison organized in form of set of tables and graphs containing values of

User Notes:

Target parameters >> Mixing tank data >> Background parameters >>

Basic Mixing Characteristics >> Radial Distribution of solids >> Axial Distribution of solids >> All in One >>



A screenshot of the VisiMix software interface showing a 3D model of a stirred tank reactor with a central impeller. Dimensions like 3100 and 1630 are visible. Text boxes provide instructions on how to change input values and calculate results.

VisiMix Orientation

A small 3D visualization of a stirred tank reactor, showing a blue liquid being mixed by a central impeller.

The VisiMix Demonstration Tools:

- ✓ VisiMix Turbulent – Examples & User Guide
- ✓ VisiMix Laminar - Examples & User Guide
- ✓ VisiMix Different Impellers – Examples & User Guide
- ✓ VisiMix RSDE– Examples & User Guide
- ✓ VisiMix Turbulent SV – Trial & Education
- ✓ VisiMix Review of Mathematical Models
- ✓ Selected Verification Examples

*The Comparison between Published Experimental Data and
VisiMix Calculations*

<http://www.visimix.com>

Millions Saved By Using VisiMix!

Benefit Examples Reported by Customers.

VisiMix LTD, is pleased to provide you with some very important new information on VisiMix Savings, which we have compiled for publication. These documents, show **savings of millions of dollars per year**. Please click the links directly below to view the following savings examples:

[Mixing Calculations in Development](#) (Saved - \$1,000,000)

[Productivity Improvement In API Company](#) (Saved - \$1,600,000)

[RSD Application in a Chemical Reaction Process](#) (Saved - \$250,000)

[Control Morphology and P.S. in Energetic Material Processes](#) (Saved - \$900,000)

[Troubleshooting for Crystallization Processes](#) (Saved \$2,000,000)

[Troubleshooting in Life Science Industry](#) (Saved €900,000)

[Three Phase System – Solid-Liquid-Liquid](#) (Saved €1,200,000)

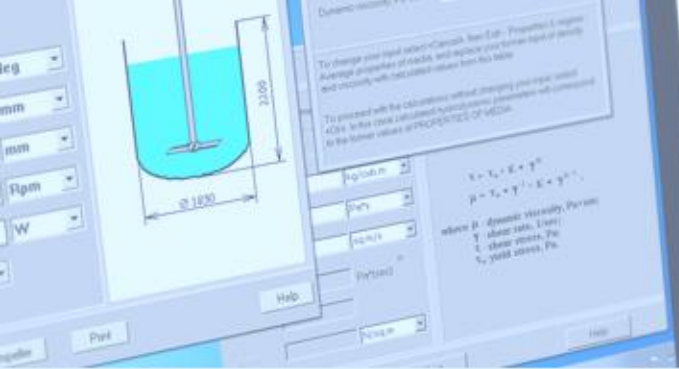
[Improve Dissolution of Organic Solid](#) (Saved €1,200,000)

[Physical Properties of the Final Product \(Solid\) – Ensuring Regulatory Compliance of \\$20,000,000 Sales](#)

We also invite you to view some highlights from our very successful [International Conference in Boston](#) and Atlanta that took place in 2011 and 2014 which united users and future users of the VisiMix Software to share some insights into the various uses and benefits of the software.

Conclusion

- **Using VisiMix Products support you can**
 - **understand better your processes**
 - **Reduce dramatically your Scaling up processes and Scaling down**
 - **Save a huge amount of Time & Money (\$1,000,000 +)**
- **The VisiMix Products are friendly and easy to use with very quick results.**
- **The VisiMix results are based on a systematic and seriously experimental checking – and found very reliable.**
- **VisiMix Projects Parameters and Data Base allows you to share and transfer the data with colleagues in the company.**



Thank you for your attention





Thank You

For your attention

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E-mail: info@visimix.com

