

Green Mile Co. is one of leading companies in agitation technology and sough-after solution partner for project specific process technology solution.

Many decades of experience, research and development at our own site in *Shiraz* have provided us with extensive process knowledge and integrated system knowledge in a variety of sectors. The technical concept, design, production, installation and initial operation of agitator will be performed by our highly qualified staff.



More than 10 years of **GMC**
Agitator design & Agitator system

What we do

GMC are experts in the designing, engineering and manufacturing of stirring and mixing equipment for applications in the (petro) chemical, sustainable energy and waste water treatment industries.

Over 10 years of experience, extensive knowledge and total commitment have resulted in GMC building a reputation as an innovative supplier of first class mixing equipment.

For example, GMC pioneered mixing systems for difficult to dissolve powders, systems for premixing and for slurries containing a high percentage of dry solids or having a high viscosity. Over the years, GMC has earned a front leading position as specialist in fluid mixing.



Our capabilities and strengths:

- GMC has collected technical know-how over many years, specializing in stirring and mixing products.
- Production with controlled manufacturing quality.
- High-reliability of GMC mixing systems.
- Simple design ensures the need for only a minimum of spare parts and maintenance.
- 24-hrs service and availability in GMC workshop and at site
- Full test facility, which enables all produced mixers to be tested before expediting
- CFD and final element analysis can be executed by our engineers



GMC Program Modules (GPM):

Database

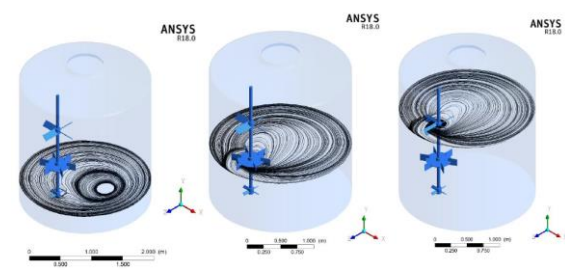
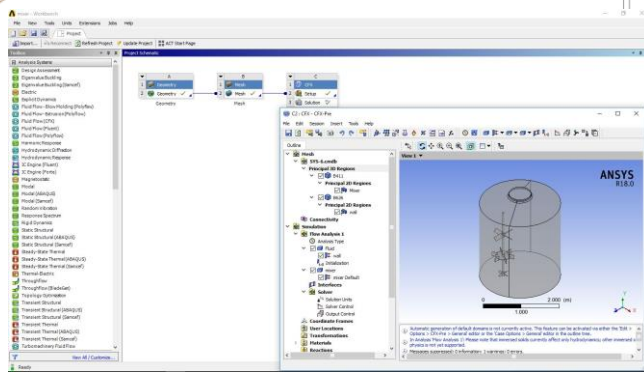
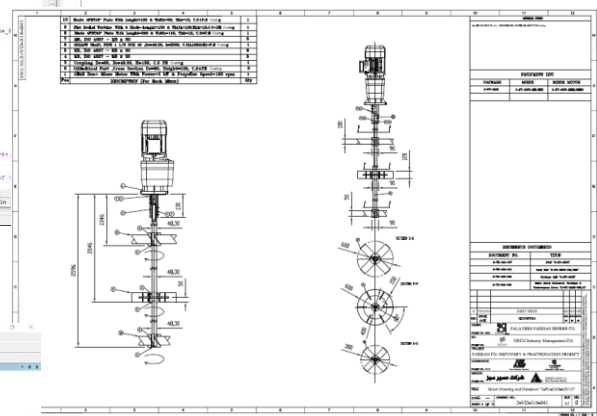
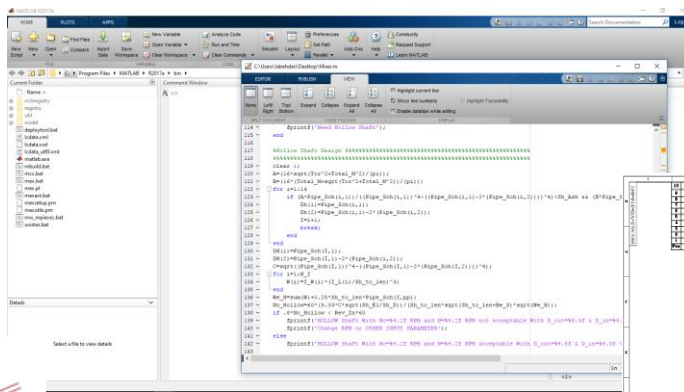
- Quickly create a database of various reactors available in the organization
- Database stores geometry details, operating conditions, plant measurements, experimental & CFD data
- Database categorized according to location of the reactor and scale
- Add, delete, import, export single or multiple reactors from the database
- Database shared across users

Reactor Analysis

- Design reactors to do a desired mixing performance
- Quickly select multiple reactors from a database & compare their performance
- Calculate mixing parameters such as power, blend time, mass & heat transfer characteristic hold-up etc
- Compare multiple reactor performance across scales & arrive at operating conditions that meet scale up criteria

Computational Fluid Dynamics

- Perform steady state single phase CFD simulation to understand the flow pattern, velocity profile etc
- All the three steps involved in a typical CFD analysis, geometry creation & meshing, iterative simulation, post processing are fully automated
- Perform rigorous CFD simulation using one of three impeller models: 2D fixed velocity data, 3D fixed velocity data & multiple reference frame (MRF)
- Process is further extended to do heat transfer analysis



Flow patterns

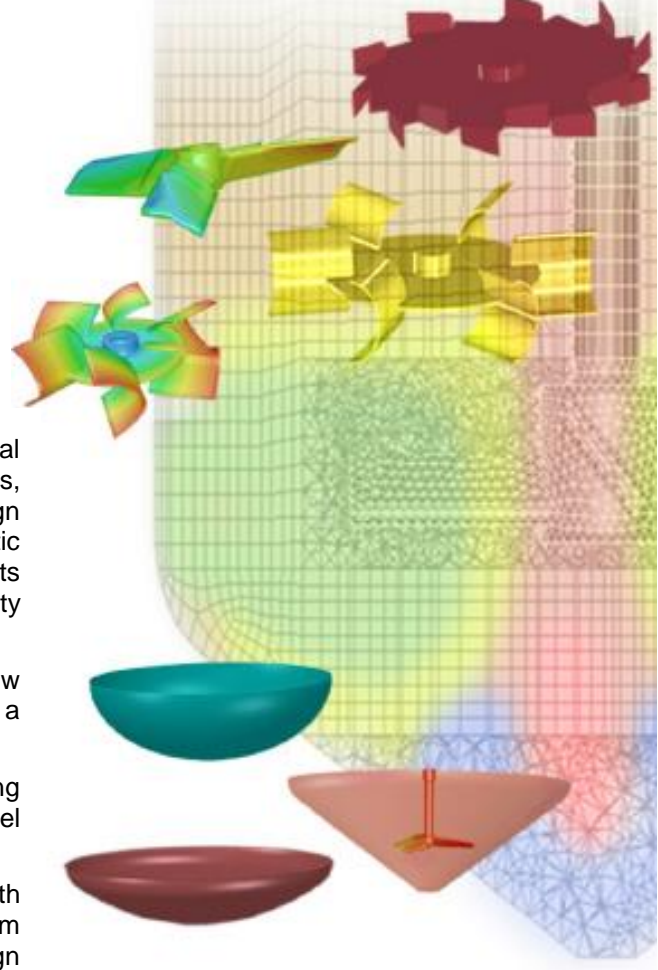
CFD simulations*

CFD simulation are used at GMC for conceptual studies of new designs, product developments, and verification of agitator engineering design and supplementation of testes under realistic condition in laboratory. They can simulate tests that are not possible with real media of safety reasons.

We use CFD simulation to assess the flow condition in the vessel and determine whether a given agitator will perform as required.

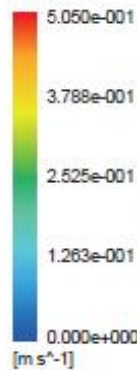
It is a further advantage that the model is running using actual dimensions and not the model dimension.

The combination of the CFD investigation with conventional agitator software ensure maximum safety regarding the process engineering design for agitator



*CFD =
Computational Fluid Dynamics

Velocity in 3tn Frame
Streamlines 1

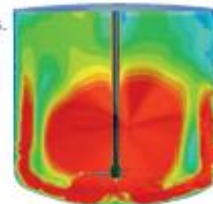
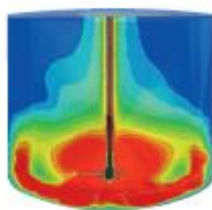
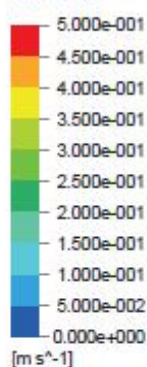


Vectors of velocities



Contours of Mass fraction of tracer
(Time = 1.3000e+01)
Mixing time calculation

Velocity
Konturs 1



- ✓ **Fully Automated 3D CFD Analysis**
Perform fully automated 3D steady state, transient, single or two phase flow analysis of stirred tanks, the CFD model can calculate performance parameter such a velocity field, shear rate distribution, flow patterns in the tank
- ✓ **Vortex shape Prediction**
CFD predicts vortex shape and vortex depth for top-mounted, centrally located impeller under fully condition. The predicted vortex shape can then be used while performing CFD analysis.
- ✓ **Powerful Report and Visualization**
GMC generate report with graphical and numeric data. Various graphical result such as contours and vector plots are generated from CFD result along with animation to show the mixing profile in tanks.

Special solutions for special applications

Propeller Designs:

GMC has various type of propeller design to meet difference type of applications, viscosity and environments. Each of this GMC propeller design would generated difference type of flow pattern, shear stress, solid suspension possibilities and gas dissolved applications.



Marine propeller
Best for high speed mixer which demand for high efficiency of turbulent flow



Turbine, 6 or 4 Blades, GA4H/6H type, pump down/up
A cost effective impeller for both turbulent, Laminar and solid suspension application



Turbine, 2 Blades, P2-type
Common paddle impeller for flocculation's



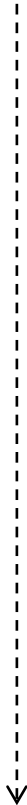
Rushton, 2 to 8 Blades, D types
Good for immiscible liquids



Rushton, 6 Blades, G type
Gas dissolved applications
Impeller for general purpose



High Efficiency Propeller
Multipurpose mixing installations



The rotational energy generated by the motor is transmitted to the impeller through the shaft and converted into kinetic energy there. At this point, fluid movement, pressure and shearing are generated. Depending on the flow pattern generated by the proportion between the pressures, shearing force and discharge direction, the flow pattern of the impeller are divided into the axial flow type and the radial flow type.





GREEN MILE Co.
Design Engineering Fabrication

Features of GMC Mixers:

- ✓ Space saving, Light weight and Easy installations & maintenance.
- ✓ Low operations and maintenance cost
- ✓ Various impeller size, revolutions and impeller designs to suit wide ranges of applications.
- ✓ Stable performance, low noise and low vibrations with cycle drive
- ✓ Long lift span of cycle drive gear motor and durable bearing lantern.
- ✓ Varies installations mounting plates are available from Din flange, ANSI Flange, M plate and any custom mounting plate.
- ✓ Various materials availabilities to meet specify environments and design. Common material are SS 304, SS316, Rubber liner and FPR Lining shaft and propellers



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