GREC

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Agitators Mixers Disperser

COMPANY PRESENTATION

- Basic History
- Capability
- Technology
- Product Line
- Markets

BASIC HISTORY

- Founded in 1903 as manufacturer of stirred vessels for chemical industry
- Part of Finder Group from 2002 to 2009
- Mixing technology and Process selection got from different major world mixer manufacturer during years. Both American and European School
- In 2010 Grec become again a Private Company, owned by Managers leaving Finder Group for getting a major focus on mixer business

CAPABILITY

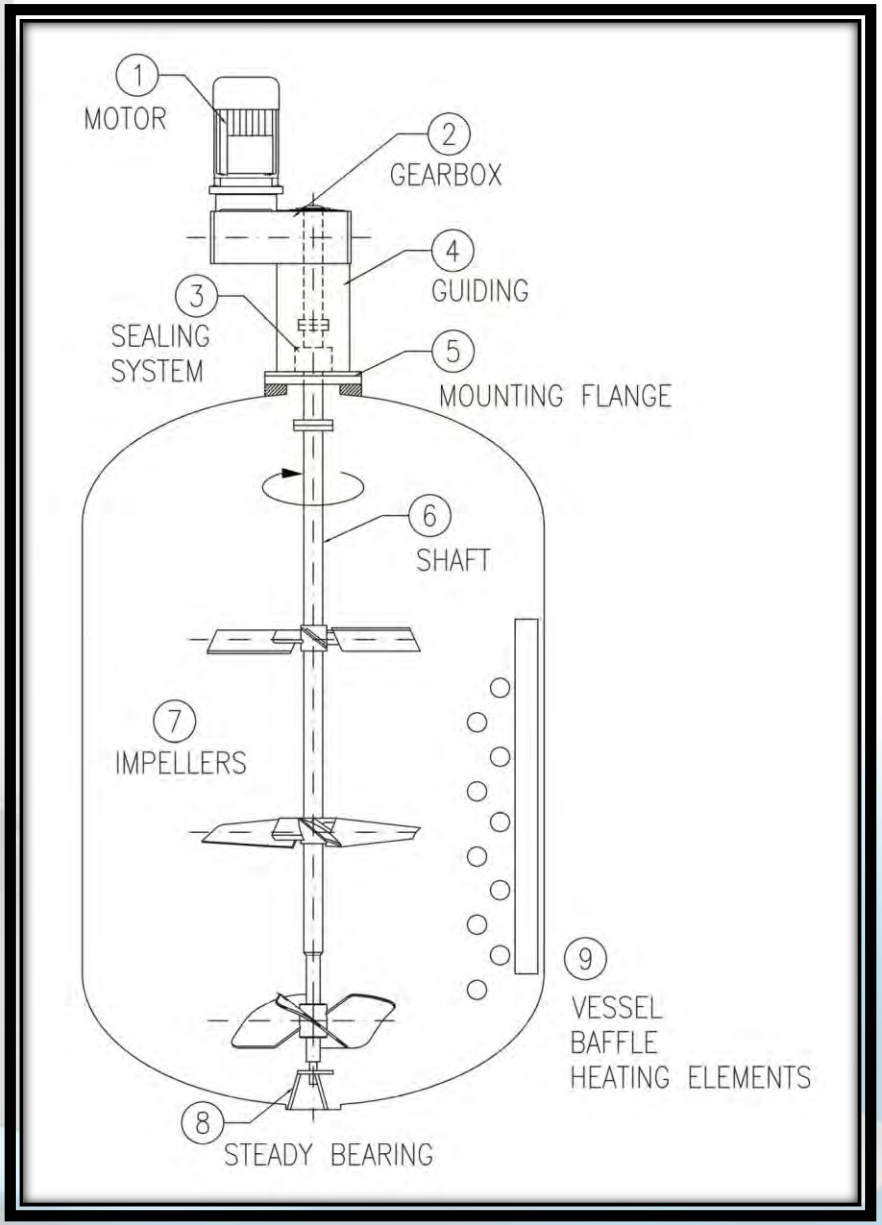
- Internal workshop 600 m^2 for machining, mounting, testing, focussed on standard mixer
- External partner for manufacturing of larger impeller and longer shaft under our design
- Mixers built up to 20 meters shaft length, and 75 kW power
- All key personnel has more than 30 years experience in mixing business
- Internal technical office for design of special mixers

WHAT IS A MIXER

COMPONENTS

Mechanical device with:

- Power source (direct/geared motor)
- Loads support (gearbox or bearing stool)
- Seal system (if required)
- Connection to vessel (flange or clamp)
- Mixing shaft (one or more pieces)
- One or more impellers
- Steady bearing (if required)
- Baffles (if required)



WHAT IS A MIXER FOR:

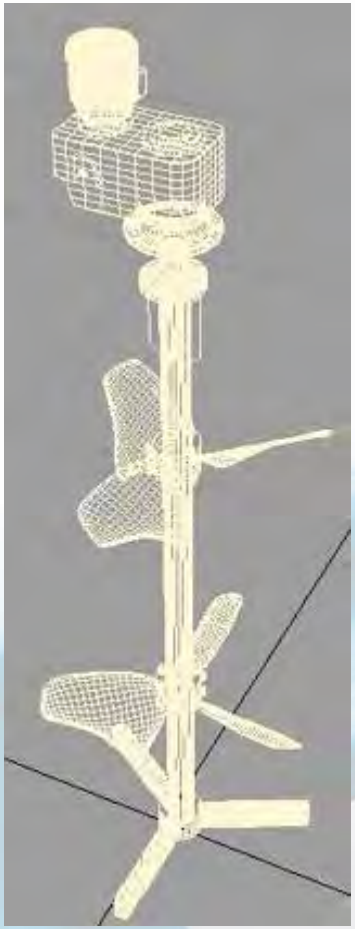
APPLICATIONS

A mixer can be used only inside a vessel containing at least one liquid and one or more phases of liquid, solids, gases. Typical applications are:

- Homogenisation (miscible liquids)
- Flocculation
- Heat Transfer
- Solids Suspension (liquid + insoluble solids)
- Blending
- Solid Dissolution (liquid +soluble solids)
- Gas Liquid Contacting (liquid +gas)
- Liquid Liquid Contacting (different liquid phases)
- Solid Dispersion (liquid +soluble solids)

MIXER TECHNOLOGY

WHAT A MIXER MANUFACTURER SHOULD KNOW



- Process sizing procedures

Validated by thousands of installations

- Perfect knowledge of impellers behaviour:

Flow generated at different viscosities, dynamic loads acting on shaft and drive unit

- Gearbox calculation

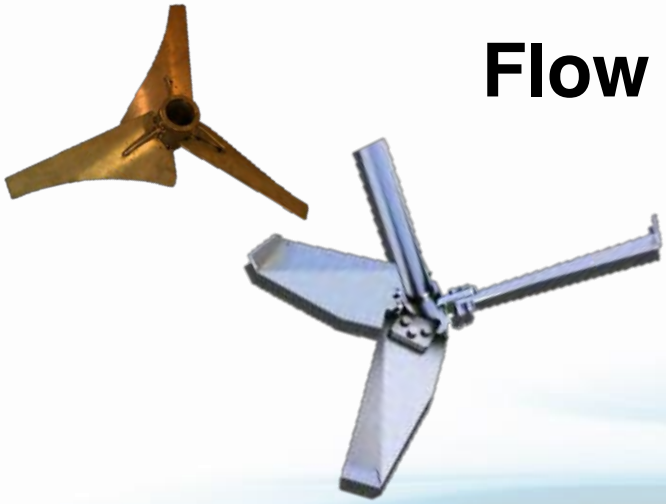
Bearings continuous working hours

- Mechanical sizing of shaft and impellers and optimized construction procedures

Guarantee performances and reliability

IMPELLER SPECTRUM

Impeller is a device which transform driver power into determined rates of:



Flow

Pressure

Shear

Behaviour is function of blades shape, surface and number

GREC STANDARD IMPELLERS






	Sabre T	Hydrofoil	Marine Propeller	Sabre C	Pitched Blade Turbine	Cowles Turbine
Flow	high	high	high	high	medium	low
Shear	low	low	low	low	medium	medium
Pressure	low	medium	high	high	high	high
Notes	Can be put very close to bottom Preferred choice for flow controlled applications	For low speed applications easy to manufacture Possibility of different blade shape for increasing shear	Used for small vessel cast manufactured low to high viscosity	For medium / high viscosity Preferred for side entry mixers	Used for medium shear, medium viscosity easy to manufacture Able to give high capacity when small openings are present	Cutting action only to disperse insoluble products Often coupled with hydrofoil

POWER AND FLOW NUMBER

$$P = Np \times N^3 \times D^5 \times b$$

P	Absorbed Power
Np	Dimensionless Power Number (Charachteristic for every impeller)
N	Rotational speed
D	Impeller Diameter
b	Specific gravity

$$Q = Nq \times N \times D^3$$

Q	Generated capacity
Nq	Dimensionless Flow Number (Charachteristic for every impeller)
N	Rotational speed
D	Impeller Diameter

THE “ART” OF MIXER SELECTION

- Define Process Requirements (Flow controlled or Power controlled applications)
- Establish Process Dependence on Mixing
    - If mixer is able to fully satisfy customer expectations
    - Capacity and Power required
- Select optimum mixer design
    - Define impeller type
    - Define impeller diameter
    - Define impeller number and positioning
    - Define impeller speed
- Calculate Power and loads on shaft and gearbox and proceed with mechanical design

TYPE OF MIXERS

- Top Entry: most purposes
- Side Entry: easy applications, large bacins
- Bottom Entry: Small or very tall vessels
- Submersible: large and deep bacins
- Portable: Lightweight for several small drums
- In Line Dynamic (with motor)
- In Line Static mixer (Flow created by a pump)

TYPE OF MIXERS

TOP ENTRY

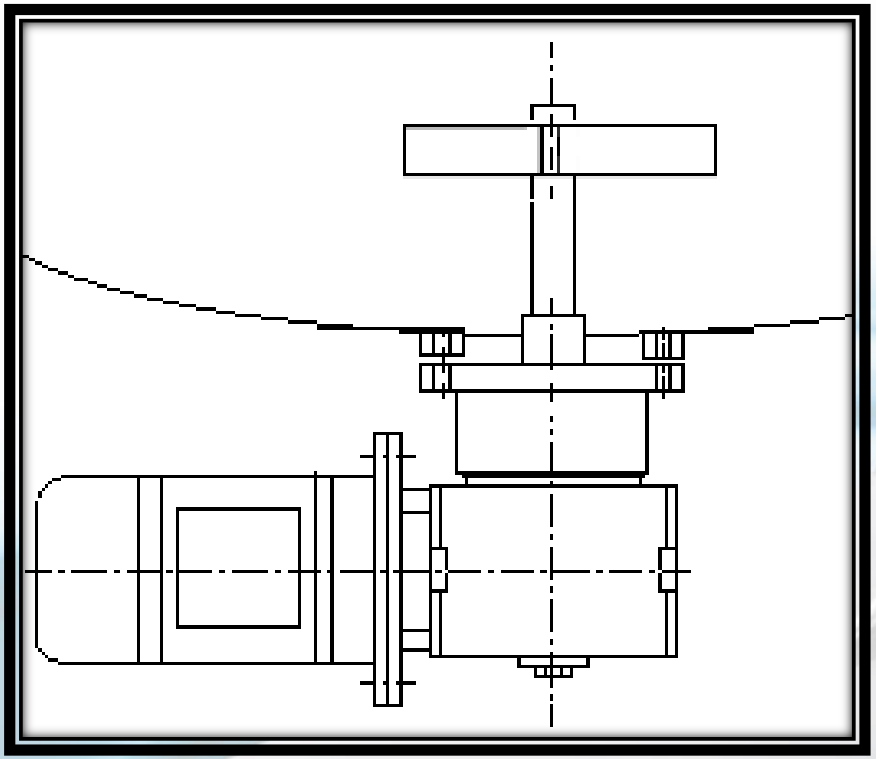
- Vertical shaft
- With or without sealing system
- With or without baffles
- One or more impellers
- With or without steady bearing

TYPE OF MIXERS

SIDE ENTRY

- Horizontal shaft
- With mechanical seal
- Tank without baffles
- One impeller
- Without steady bearing

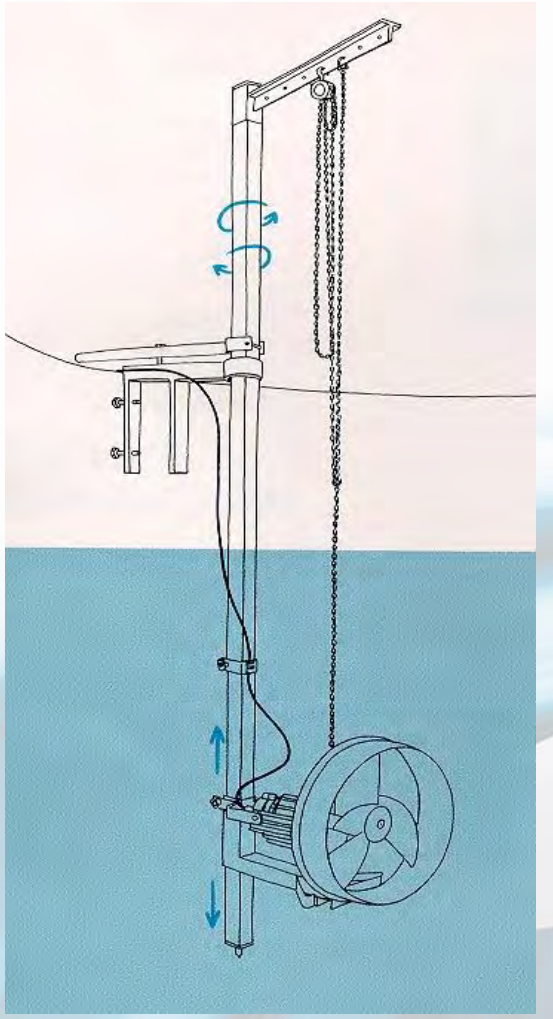
TYPE OF MIXERS



BOTTOM ENTRY

- Vertical shaft
- With double mechanical seal or magnetic coupling
- With or without baffles
- One impeller
- Without steady bearing

TYPE OF MIXERS



SUBMERSIBLE

- Same applications than side entry
- Supported on a structure with hoist
- Without baffles
- Possibility to change elevation and orientation

TYPE OF MIXERS

PORTABLE

- Clamp or flanged mounting
- Lightweigth for ease of transport
- Suitable only for small drums
- Possibility of Folding propeller

TYPE OF MIXERS

STATIC INLINE

- Inline blending
- Adding chemicals in flowing water
- Increase efficiency of chemical reactions in pipes
- For turbulent or laminar (viscous) regime
- Liquid blending or Gas/Liquid dispersion
- Any Application need a suitable geometry for mixing elements

SIDE ENTRY RANGE

Model: **AL (High speed mixers**)
Drive unit: aluminium stool with bearing or direct motor
Speed range: 700÷900 rpm
Power: 0,37-11 kW
Seal : Single mechanical inside product

Model: **ALF (Low speed small mixers**)
Drive unit: Worm type garbox
Speed range: 140÷280 rpm
Power: 0,12-4 kW
Seal : Single mechanical inside product or cartridge in stool

Model: **ALC (Low speed mixers**)
Drive unit: Cast iron bevel type gearbox with taper roller bearings
Speed range: 190÷350 rpm
Power: 2,2-55 kW
Seal : Cartridge in stool, single or double, with optional shut-off, flushing and removable coupling

TOP ENTRY RANGE

Model: **AV (High speed mixers**)
Drive unit: alluminium stool with bearing or direct motor
Speed range: 750÷1500 rpm
Power: 0,12 ÷ 18,5 kW
Shaft diameter: 15 ÷ 65 mm

Model: **AVF (Low speed small mixers**)
Drive unit: Worm type gearbox
Speed range: 50÷280 rpm
Power: 0,12 ÷ 4 kW
Shaft diameter: 25 ÷ 50 mm

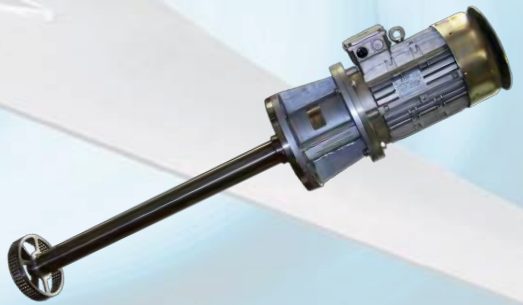
Model: **AVC (Low speed mixers, hollow shaft, horizontal motor**)
Drive unit: Cast iron bevel type gearbox with taper roller bearings
Speed range: 15÷250 rpm
Power: 1,1 ÷ 55 kW
Shaft diameter: 40 ÷ 110 mm

TOP ENTRY RANGE

Model: **AVL (Low speed mixers, hollow shaft, vertical motor**)
Drive unit: Cast iron parallel shaft gearbox with taper roller bearings
Speed range: 15÷250 rpm
Power: 1,1 ÷ 55 kW
Shaft diameter: 40 ÷ 110 mm

Model: **AVS (Low speed mixers, solid shaft, vertical motor**)
Drive unit: Cast iron helical type or planetary type with taper roller bearings
Speed range: 15÷360 rpm
Power: 0,25 ÷ 55 kW
Shaft diameter: 25 ÷ 125 mm

Model: **TD (Turbodisperser**)
Drive unit: Motor
Speed range: 1450 rpm
Power: 1,5 ÷ 55 kW
Shaft diameter: 25 ÷ 80 mm



MARKETS

Today GREC expertise is recognised in a wide range of fields of application as:

- Food & Beverages
- Pharmaceutical & Biotechnology
- Chemical
- Paint & Varnishes
- Water & Waste Waters (including Paper & Steel)
- Ceramic
- Oil & Gas, Biogas

FOOD & BEVERAGES

Lot of applications in this field: drinks preparation and storage, fruit juices, wines and alcohols, dairy products,

Mixers are made entirely from polished stainless steel, has no hold-up and are adapted to the pressure and temperature constraints for both manufacturing process and on site sterilisation and cleaning cycles.

Mixers are both top entry, side entry or bottom entry

Also disperser are used

PHARMACEUTICAL

Pharmacy is a sector characterised by considerable constraints in the fields of traceability and cleanability, to which are added those of the various international standards

Mixer applications are:

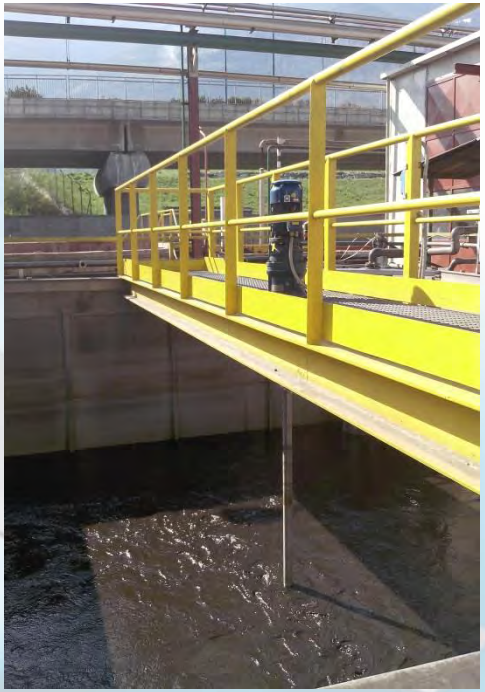
- Simple product blending of different ingredients
- Emulsifying active ingredients in inert supports (such as glycerine suppository).
- Bacteriological fermentation agitation, to oxygenate the bacteria
- Cellular fermentation with slow agitation that is not to destroy the cells which generally reproduce on micro-carriers

CHEMICAL

- 80 % of the stirrers manufactured are designed to be assembled on reactors, the very heart of a production process that requires a high level of reliability for long duration use with no manufacturing shutdown
- Function of process temperature and pressure is selected mechanical seal
- Most of times it is required ATEX certified apparatus
- Applications are: Base chemistry, Soap and detergents, Polyurethanes, Paint and Varnishes, Biofuels,
- For small production Portables and Gantry entry are required

WATER & WASTE WATERS

- Top entry mixer for all steps in a waste water treatment plant
  - Chemical make up (Polyelectrolite, Lime, activated carbon, etc..),
  - Equalization bacin (when waste water is coming from different locations),
  - Neutralization bacin for Ph control,
  - Flash mixing (quick adding of coagulant or flocculant),
  - Flocculation bacin,
  - Sludge holding after flocculation,
  - Sludge Digestion, Aeration of denitrification bacin
- Side entry mixer or submersible mixer for sludge digestion
- Static mixer for chemical make up and neutralization



CERAMIC

- Static mixers for adding colours to glaze
- Intimately mixing of red and white slips. Sabre impellers give high flowrate without being affected by apparent viscosity of the fluids.
- Keep well suspended solids in water coming from ceramic waster water sump. One mixer can operate in volume up to 500 m^3.
- Achieve high homogeneity in glazes and dyes blending up to 15 m^3

OIL & GAS

- Inline blending/reaction applications for static mixers (gas and liquid)
- Required PED certification
- Inline dynamic mixer when higher shear is required
- Side Entry mixer for large oil storage vessel: blending of different grade of crude or fuel oil, avoid sedimentation in crude oil
- Required ATEX certification

RENEWABLE ENERGY

- Biogas is produced by anaerobic digestion of biodegradable materials such as manure, sewage, municipal waste, green waste, plant material, and crops
- Top Entry mixer
    - small diameter digester with rigid roof
- Side Entry mixer
    - large digester with membrane roof