New Static Mixer

Realization of high-performance and reasonable price with unique module-production method !

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DALIAN NISSHIN JABARA IND.CO.,LTD.

Company profile

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Establishment : May, 10, 1962

Capital : 49.5 million, Paid-up capital of China branch : 1.5 million US$

Director :
Chairman ; Ken Tsukada
President ; Akio Tsukada
Exclusive director ; Sumiko Kitamura
Director Plant manager ; Akira Enomoto
Director ; Luo Lin
(General manager of China branch)

Correspondent bank : Bank of Tokyo-Mitsubishi UFJ ; Jinbocho branch and Kanda branch
Mizuho Bank, Ltd. ; Kanda branch and Kanda-ekimae branch
Sumitomo Mitsui Banking Corp. ; Kanda-ekimae branch
Yachiyo Bank Ltd. ; Kanda branch

Belonging to organizations : The Japan Chamber of Commerce and Industry
Japan Ship Machinery & Equipment Association

Patent

Japan Total 14 rights : Production method of bellows ; 5 rights, PP Seal, FN Tape ; 2 rights,
Assemble kit of cover for existing piping ; 2 rights,
Separation method of acid discharge liquor ; 2 rights, Vapor mixing equipment, and
Circulating clarification and sterilizing equipment for sewage.

U.S.A. Total 3 rights : New static mixer and FN Tape ; 2 rights

EPC Total 4 rights : FN Tape (UK, France, Germany and Italy)

Germany 1 rights : New static mixer

Taiwan 2 rights : New static mixer and FN tape

Korea 2 rights : New static mixer and FN Tape

China 1 right : New static mixer

Patent of cover of existing piping ;Green cover: China, Korea, Hong-Kong, Vietnam, India and Singapore

Key is a unique Module-system !

Patents of New Static Mixer :

1. Patent :
   - (1). Japan ; 13 rights
   - (2). USA ; 3 rights
   - (3). Germany ; 1 right
   - (4). EPC ; 4 rights
   - (5). Taiwan ; 2 rights
   - (6). Korea ; 2 rights
   - (7). China ; 1 right
2. Utility model right in Japan ; 3 rights
3. Trademark in Japan in Japan ; 2 rights
4. Registration of design in Japan ; 2 rights

Application samples

1. Liquid and liquid

- Mixing, dilution, neutralization and adjustment of quality of different liquids
- Adjustment of quality and viscosity to vegetable oil, mineral oil, etc.
- Adjustment of different water qualities or hardness or aeration of drinking water

2. Liquid and vapor or gas

- Mixing, reaction, dissolution or aeration of liquids by air or gas
- Gas cleaning, flotation or aeration of activated sludge
- Deaeration of dissolved vapor by splitting
- Oxidation, floating or precipitation of air-blown sewage by dissolved oxygen

3. Liquid and solid or powder

- Splitting, mixing or homogenization of solid or powder in liquid

4. Heating and Cooling (Direct or indirect)

- Avoidance of local heating or enhancement of heat conductivity
- Homogenization of liquid temperature and residence time background
- Cooling of thinner, paint, lacquer or diluent
- Production of hot water or cold water or temperature adjustment of hot spring

5. High-viscosity fluid

- Mixing of resins or addition of pigments, hardener, softener or stabilization agent to molten resin.
- Mixing of high-viscosity addition to food
- Temperature equalization or homogenization of molten plastic

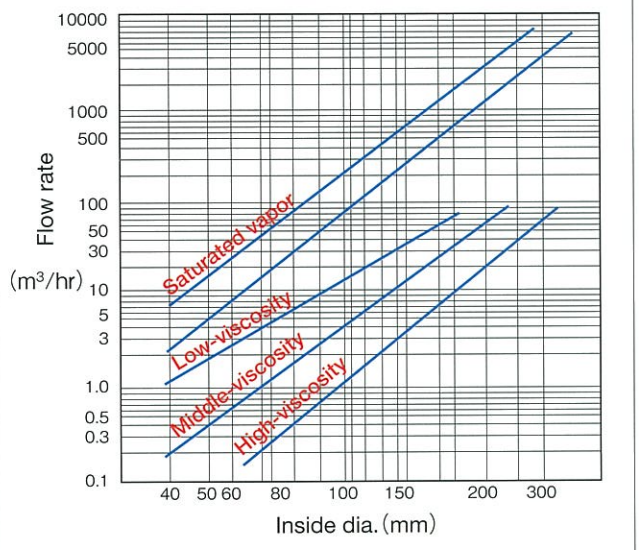
6. Liquids with different viscosity

- Mixing of low-viscosity addition to polymer or dye solvent to viscose
- Dilution or splitting of high-viscosity liquids

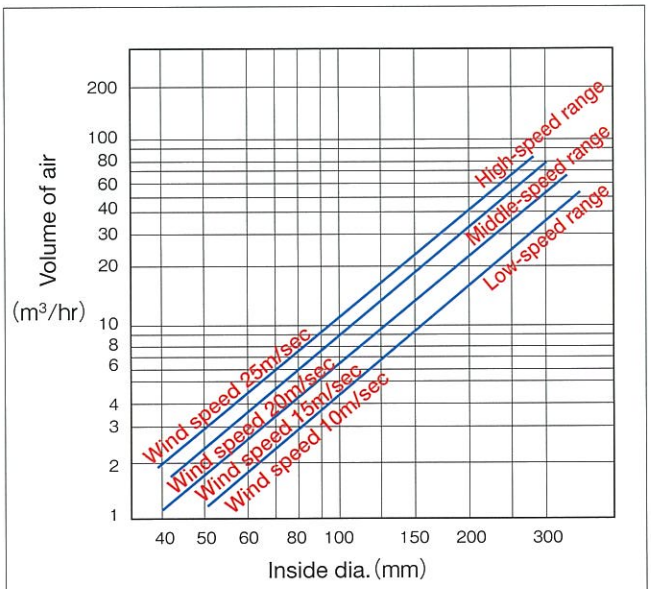
It is very important to select model, size and number of blocks of New Static Mixer due to characteristics of fluids and planning flow rate and grasp prompt pressure drop by the mixer at initial stage of planning on piping with the mixers.
Then we introduce approximate calculation data based on some standard and condition as follow ;

1. Fluid and inside diameter of pipe

- **Low-viscosity fluid:**
  Up to 1000 cP : Fluid with high liquidity such as air, steam, water, oil, etc
- **Middle-viscosity fluid:**
  Up to 50,000 cP : Fluid with middle liquidity such as resin monomer, silicon oil, etc.
- **High-viscosity fluid:**
  Up to 500,000 cP : Fluid with low liquidity such as pasty fluid, sealant, adhesive. etc.



Graph 1 : Diagram for relationship of flow rate and standard inside dia.



Graph 2 : Diagram for relationship of volume of air and inside dia.

2. Standard inside diameter of pipe to flow rate

You can get data on inside diameter of pipe, meeting planed flow rate, due to Graph 1, which shows trends of saturated vapor, compressed air and other fluids.
As to vapors such as air, gas, etc. You can also do due to Graph 2

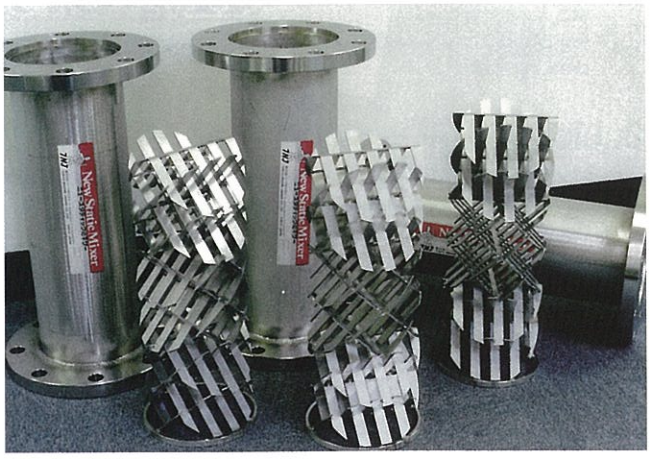
When data from Graph 1 and 2 is middle range of designated diameter of pipe, please select smaller one in the graph, which is to get better efficiency of mixing, if pressure drop is relatively higher than planned one and the drop is acceptable.

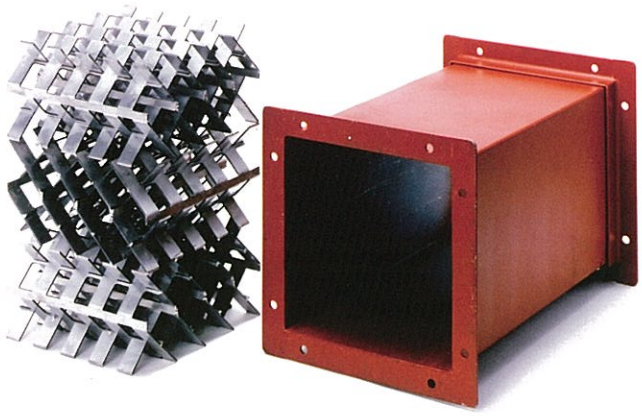
3. Selection of model

Please select model by referring to the follow
(1). WA : Air or other low-viscosity fluid.
(2). WB : High-viscosity fluid ; It will be effective to lower pressure drop.
(3). L or LS : In the case that there is possibility of accumulation or clogging in mixer.

4. Selection of mixer length

Mixing performance is dependent on kinds of fluid in allowable range, but it will be mainly decided based on length of mixer (Number of blocks).
We used to decide the length with visual check through some examinations, but we decide it by calculation formula at this time.
Generally 5 to 8 blocks will cover practical effectiveness on mixing in many cases.
In the case of L or LS model, 20 to 30 % longer length than one of WA and WB is more effective.
Minimum blocks for WA and WB is 2. Due to conditions on piping, achievement, expected performance and/or number of blocks is finally decided.





Mixer for □300x300 duct

5. Pressure Drop

Pressure drop of New Static Mixer is mainly decided due to flow rate, flow speed, density, viscosity and length of mixer (Number of blocks). If pressure drop is not important factor, smaller length is higher cost-performance.
However selection of inside dia. should be prudently studied to avoid excess pressure rise in piping with the mixer except for cases of limitation of piping space and alternative piping to existing one.
At an initial stage of planning, if fluid is liquid, flow rate is decided on Graph 1 and rough pressure drop per one block is got on Table 1.

Table 1 : Pressure drop per block

Viscosity of fluid	Range of flow speed m/sec	Rough pressure drop kg/cm²
Low-viscosity fluid	1.5~2.0	0.15~0.2
Middle-viscosity fluid	0.35~0.80	0.5~1.5
High-viscosity fluid	0.05~0.25	1.5~3.0

We will calculate pressure drop based on presented data of fluids and undermentioned calculation formula.
Please sent Questionnaire on page 10 with necessary data to us for our study.

6. Pressure drop calculation formula

Turbulent flow

$\triangle Pn = n \cdot Ne \cdot \rho \cdot V2 \cdot 10^{-4}$

Laminar flow

$\triangle Pn = n \cdot Ne \cdot Re \cdot \mu \cdot V/D \cdot 10^{-4}$

$\triangle Pn$: Pressure drop of the total length (total number of blocks)
n : Number of blocks
Ne : Pressure drop coefficient
Re : Reynolds number
ρ : Weight density
μ : Viscosity
V : Flow speed
D : Inside diameter of pipe

Please use the above formula with much attention by studying the follows :

(1). Mixing of vapors : Turbulent flow
In the case of much difference among weight densities : Laminar flow

(2). Mixing of low-viscosity liquids : Turbulent flow

(3). Mixing of high-viscosity liquids : Laminar flow

(4). Mixing of liquids with much difference among viscosities : Laminar flow

If ratio of viscosity for mixing liquids is over 1,000, it will be difficult to get good mixing performance. Then much more prudent study is required to decide specification of the mixer.

In the case of mixing in high-rate of high-viscosity fluid, length of the mixer should be longer, 1.5 times or so, compared with mixing of fluids with similar viscosities.
Length of the mixer for mixing in high-rate of low-viscosity will be shorter.

Specification of New Static Mixer should be selected and decided as calculated pressure drop on the above is lower than allowable one.

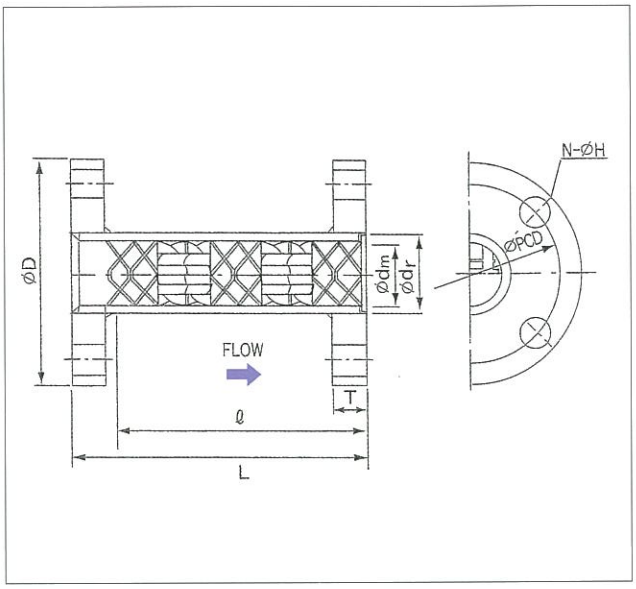
It is necessary to consider piping system with pump or blower to complement pressure drop by the mixer.

Furthermore in the case of difficult mixing which cannot be covered with experience and design guide, some trials and analysis of data will be needed.

Structure of New Static Mixer

Standards size of Mixer and Housing pipe (Unit : mm)

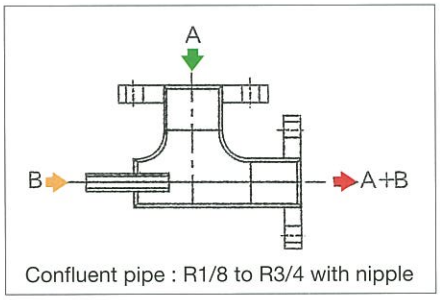
Desig-nated dia.	Mixing blade			Housing pipe				
	Φdm	ℓ=1B/5B	Φdr	ΦD	PCD	N-ΦH	T(mm)	L(mm)
15A	13.8	13/65	21.7	95	70	4-15	12	100
20A	22	21/105	27.2	100	75	4-15	14	150
25A	27	24/120	34.0	125	90	4-19	14	200
32A	36	29/145	42.7	135	100	4-19	16	250
40A	42	35/175	48.6	140	105	4-19	16	250
50A	54	47/245	60.5	155	120	4-19	16	300
65A	68	59/305	76.3	175	140	4-19	16	400
80A	80	71/355	89.1	185	150	8-19	18	500
100A	104	93/475	114.3	210	175	8-19	18	600
125A	128	105/535	139.8	250	210	8-23	20	700
150A	154	148/650	165.2	280	240	8-23	22	800



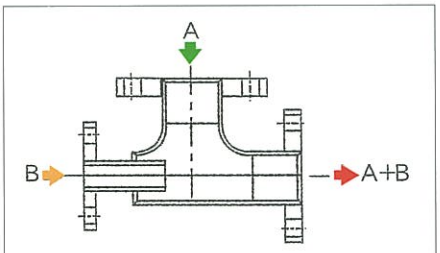
Note : 1) The above sizes of mixing blade are based on Type: WA x 5B, Housing pipe : Sch10S and Connection : JIS-10K Flange.

2) The above date will be changed due to design conditions, regulation of pipes and customer's requests.

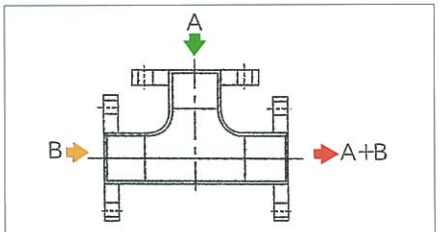
Style of main pipe and confluent pipe



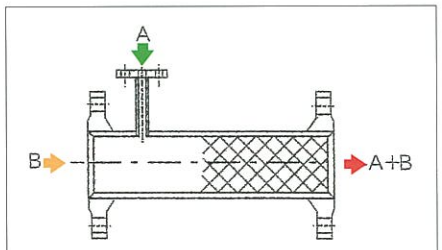
Confluent pipe : R1/8 to R3/4 with nipple



Confluent pipe : 25A to 150A with flange

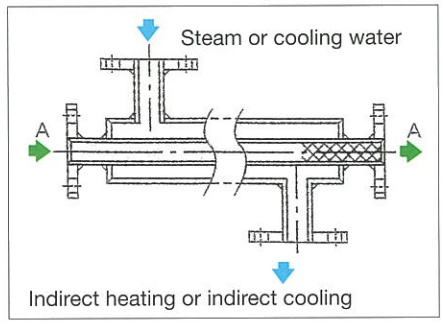


Main and confluent pipes of the same size with flange (Ratio of mixing ; 100:100)



Long distance of face to face

Note: Up on requests, confluent pipe with nipple, flange and other connectors are available.



Indirect heating or indirect cooling

Flow rate and mixing ratio of confluent pipe to flow rate of main pipe

Main pipe / Confluent pipe	25A (100%)	32A (100%)	40A (100%)	50A (100%)	65A (100%)	80A (100%)	100A (100%)	125A (100%)	150A (100%)
R1/8	7%	4%	3%	2%	1%	1%			
R1/4	12%	7%	5%	3%	2%	2%	1%		
R3/8	22%	13%	10%	6%	4%	3%	2%	1%	
R1/2	35%	20%	15%	9%	6%	4%	3%	2%	1%
R3/4	61%	36%	27%	17%	10%	7%	5%	3%	2%
25A	100%	59%	44%	26%	16%	12%	7%	5%	4%
32A		100%	75%	46%	27%	20%	12%	8%	6%
40A			100%	62%	38%	26%	16%	11%	8%
50A				100%	61%	44%	25%	16%	12%
65A					100%	72%	42%	28%	20%
80A						100%	59%	40%	28%
100A							100%	66%	47%
125A								100%	71%
150A									100%

A: Main pipe, B: Confluent pipe, A+B: Main pipe after mixing

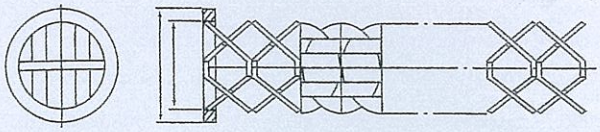
1. The above mixing ratio is based on ratio of volumes on cross sections on main pipe and confluent pipe.
2. As to pressure at entrance of main pipe or confluent pipe, pressure of liquid with smaller weight density and lower viscosity should be higher.
3. Some kinds of flange regulations are available, JIS, JPI, ANSI and others. Range of pipe schedule is available 5 to 40.

Standard style of New Static Mixer

WA Structure and Feature

This is a basic structure of New Static Mixer and suitable to mixing of low-viscosity fluid, vapor, gas, steam, etc.
Main feature of the structure is that each block is fitted as the flat part of element faces flow direction at right angle.

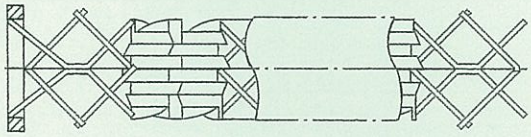
Skeleton diagram of structure



WB Structure and Feature

This model is fixed as flat part of element face parallel to flow direction in order to reduce pressure drop for mixing middle and high-viscosity fluid. This model has good performance to mix, disperse and homogenize resin polymer, latex, rubber, etc.

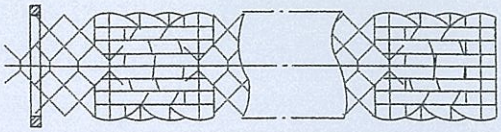
Skeleton diagram of structure



WW Structure and Feature

This model is designed to realize the most effective performance in short length by double fixing one element with special shape. This is used to mix, clean, divide and dilute low-viscosity fluid, vapor, gas, etc. in many fields.

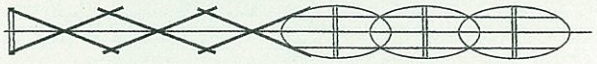
Skeleton diagram of structure



XB Structure and Feature

Each component is fitted at acute angle and the fixed one is inserted tube of multi-pipe heat exchanger. This model is used to improve heating or cooling effectiveness with turbulent flow, or dilute, mix and homogenize low-viscosity fluid in relative small piping.

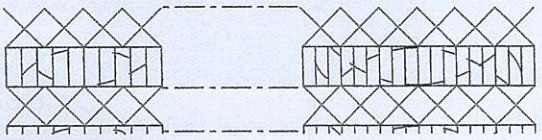
Skeleton diagram of structure

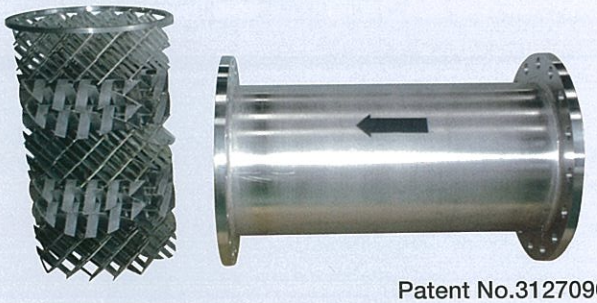


XL Structure and Feature

This model is designed for big-dia. mixer and one of the features is that X shape modules are fixed in order to divide, mix and disperse fluids to sections. This is used in many kinds of business field to mix steam and gas and wash, homogenize and react fluids etc. Rectangular model is also available.

Skeleton diagram of structure





Patent No.3127090

RM Structure and Feature

This model is designed to inset in tube of heat-exchanger, where there is not much pressure drop and clogging, or mix and agitate powders when a system is structured with only this model.When this model is assembled at end of WA, WB and XL model, this changes turbulent flow to laminar flow with mix and agitation.

Remarks

Material : Standard material is SUS304, but other materials are available such as SUS304L, SUS316, SUS316L ,etc.

Thickness of blade : Range of thickness is 1.2 to 2.5 mm. It is decided up to size and operating pressure.

Structure : Due to required performance and application, number of blocks and bending angle of elements are decided. Rectangle model is also available.

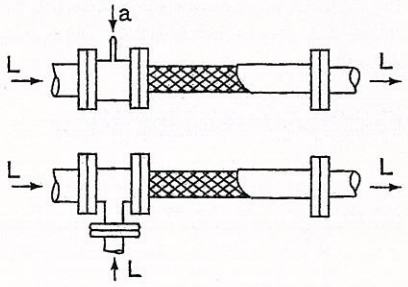
Surface finish : Acid cleaning are standard, but other finish such as electrolytic frightening, etc. are available.

Applications of New Static Mixer

L : Liquid, A : Air, G : Gas,
S : Steam, a : Additive, C : Coolant

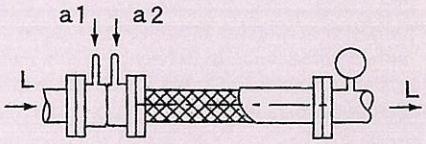
1: Adjustment of concentration, hardness, water quality, viscosity, etc.

Mixing raw materials and adjustment of mixing, addition, concentration, viscosity, hardness and quality of additive and adhesive.



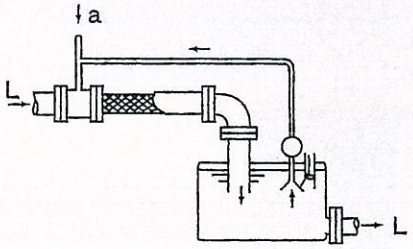
2. Neutralization and adjustment of pH

Neutralization and adjustment of pH for waste water, discharge liquor, other disposal water, etc.



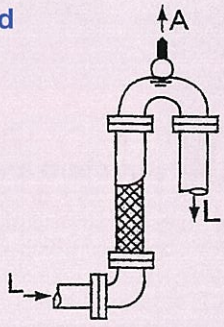
3. Dilution

Dilution of concentrated liquid, undiluted solution, paint, adhesive, etc.



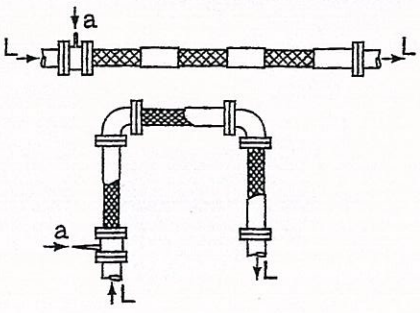
4. Deaerator and bleed

Deaerator and bleed of vapor in fluids, which are able to be separated by effectiveness of division, at top portion in piping.



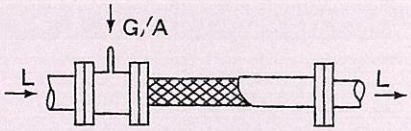
5. Chemical reaction (Adjustment of resistance time)

In the case of long resistance time for reaction and absorption, installation of mixers is very effective to accelerate them.



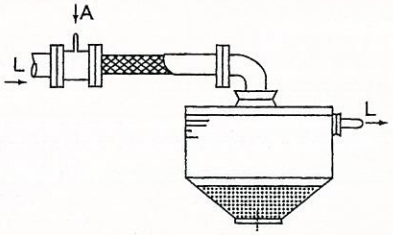
6. Dissolution and aeration

Mixing, dissolution and aeration of gas, air, vapor to liquid.



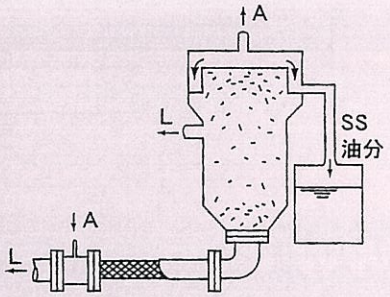
7. Cohesion and sedimentation

Saturation of dissolved oxide and promotion of cohesion and sedimentation of sludge by contact with vapor at pretreatment process.



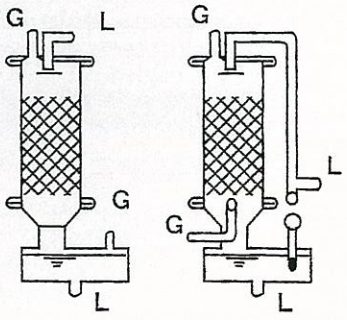
8. Floatation

Promotion of adsorption floatation of suspended solids and oil content by minuteness and homogenization of bubbles.



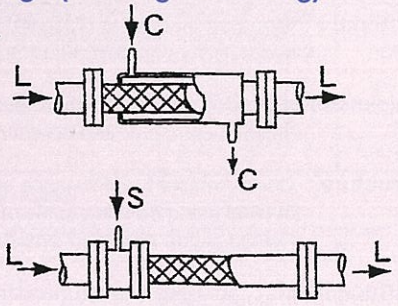
9. Cleaning by gas

Cleaning by effective gas absorption and chemical reactions due to homogenization of mutual mixing and diffusion in reactants and resistance time in wide interface between liquids.



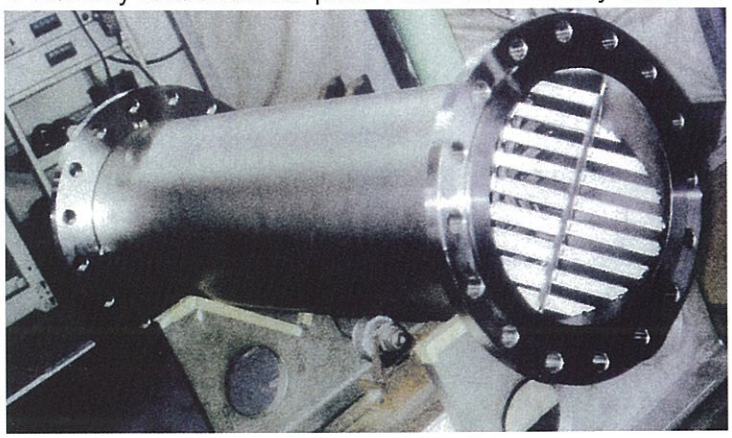
10. Heat exchange (Heating or cooling)

Direct heat sterilization by steam and heat exchange by coolant.



Instance of New Static Mixer

▼ Delivery to a chemical plant : 500A x 1000L by titanium



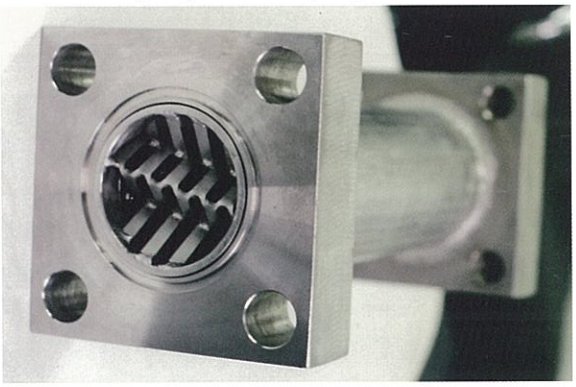
▼ For mixing of high-viscosity adhesive

▼ For mixing two liquids with nozzle

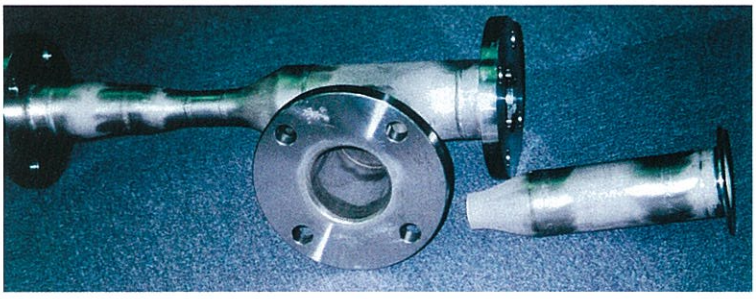
▼ For process piping

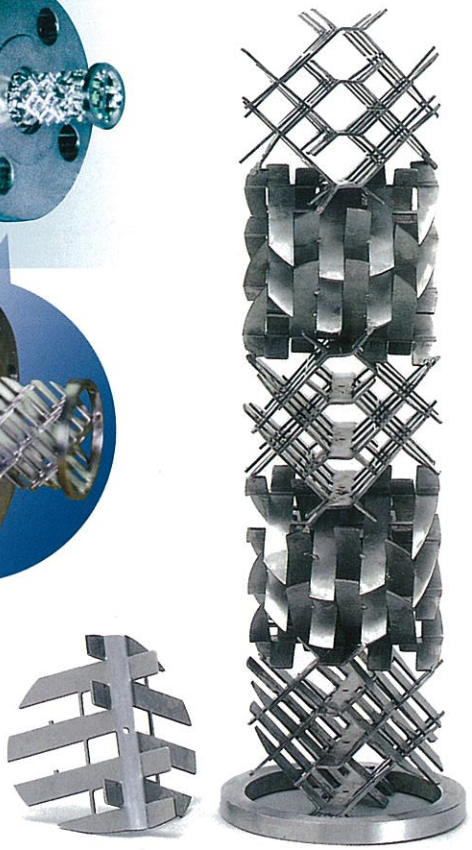
▼ For mixing chemical agents in sewage disposal plant

▼ For mixing high-viscosity liquids ; 200,000 cP



New Static Mixer





Date / /

Questionnaire
New Static Mixer

to create an offer

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http://www.dnsek.com, e-mail: dnsek@dnsek.com

Company:	.....	Name:	.....
Department:	.....	Tel:	..... – .....
Street:	.....	Fax:	..... – .....
City/zip code:	.....	E-mail:	.....
Country:	.....		

1. General

1.1. Puropose of intrdoduction : .....

1.2. Place of installation : .....

1.3. Quantity of request : ..... set (s)

1.4. Suggested Delivery Date : Y..... / M ..... / D .....

2. Mixing Agents

Kind of fluid		Flow rate (m^3/hr)	Density (kg/m^3)	Viscocity (cP)	Temp. (Celsius)	Pressure (MPa)	Allowance of Pressure Drop (MPa)
A							
B							
C							

3. Materials

If you have any requests, please click the following. (Standard : SUS304)

Kind of fluid	SUS304	SUS304L	SUS316	SUS316L	SS400	Others
Mixing Element						
Housing Pipe						
Flange						
Others						

4. Size and Standard

4.1. Pipe size : .....

4.2. Required Standared

Flange	JIS	ANSI	JPI	Others

5. Other requests

Products line-up

1. Non-metallic flexible joint, chute, cover, expansion offset-absorption joint (Patented), etc., made by rubber, resin, organic or inorganic fiber woven cloth etc., for dustproof, vibration isolation, heatproof, cold-resistance, wear resistance to chemical, resistance to pressure and weather resistance.
2. Cover for sliding face on machine tool, shade of optical instrument, safety cover on lift, etc.
3. Sealing rubber for double-wall piping on the ground or under the ground. ; PP-Seal : Patent and Trademark
4. Splashing and leakage protection cover of liquid, vapor, powder, etc. from new and/or existing piping ; Green cover : Patent and Trademark
5. Teflon bellows, flexible tube and hose
6. Metal flexible hose, metal flexible joint with connectors, tube and hose.
7. Bellows with floating, “Movable collection trough” for collecting top layer liquid of sewage or compressed floating matter in disposal facilities : Utility model right
8. New Static Mixer : Patent, Utility model right, Design patent and Trademark
9. Anti-Splashing Tape and Sheet of flammable oil in ship engine room, FN Tape and Sheet, : Patent and Trademark
10. Splashing and leakage prevention band : Leak None Band
11. Splashing and leakage prevention tape : Leak None Tape
12. Coupling for connecting metal pipes or repairing : MP Joint

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Distributor

*Specification and Characteristics may be changed for improvement of quality without prior notification.

2014.07.1000HK