

NOVIN COMPOSITE SADRA





Petroleum and Petrochemical , Aerospace, Marine ,
Water and Wastewater industries



Introduction

Novin Composite Sadra (NCS) is a producer of pipe, fitting, tank, vessel and other composite structures such as thermal shield and epoxy adhesive (general and special grade) in Iran.

This company produces a wide range of chemical and heat resistance products for chemical, petrochemical, aerospace, drilling, mining, and water industries.

This knowledge base company has established a strong and close relation with local universities and industries.

Some products of this company are high tech innovative composite structures which make it pioneer in the field.

Advantage of composites:

Design Flexibility – Thermoset Composites give designers nearly unlimited flexibility in designing shapes and forms. They be molded into the most intricate components and can be made a wide range of densities and chemical formulations to have precise performance properties.

Low cost per cubic inch – When comparing costs based on volume, thermoset composites have lower material costs than traditional materials such as wood, engineered thermoplastics and metals. In addition, because thermoset composites have a low petroleum-based content, they are not subjected to the price fluctuations experienced in petroleum-based products.

Lower material costs – Because thermoset composites can be precisely molded, there is little waste and therefore significantly lower overall material costs than metal products.

Improved productivity – Industrial Designers and Engineers are able to reduce assembly costs by combining several previously assembled parts into a single component. Also, inserts can be molded directly into the part during the molding process thereby eliminating the need for a post-process. In addition, composites do not usually require additional machining, thereby reducing work-in-process and time to market.

Light Weight

Low Thermal Conductivity

High Strength Related to Weight

High-Impact Strength

Durable

Corrosion Resistance

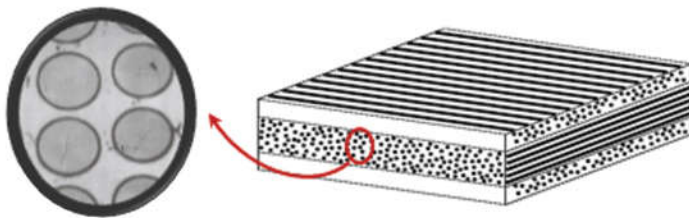
Nonconductive

Nonmagnetic

Composite structure

In its most basic form a composite material is one, which is composed of at least two elements working together to produce material properties that are different to the properties of those elements on their own. In practice, most composites consist of a bulk material (the 'matrix'), and a reinforcement of some kind, added primarily to increase the strength and stiffness of the matrix. This reinforcement is usually in fiber form.

Resin gives the chemical and weathering resistance and fibers is responsible for mechanical properties.



Wall Structure

Inner layer : resin reach blend

Barrier layer : inside chemical resistance layer of the products. Is in direct contact with the media. This layer should be very smooth for the pressure drop and settlement problems.

Structural layer : consisting of resin and fibers and ensure the mechanical strength

Outer layer : rich resin layer filled with anti-UV agents





Resins and their properties

Only the most common resins of the thermoset family and the ones mostly used in composite construction are described below.

Polyester (Orthophthalic and Isophthalic)

Unsaturated polyester resins are the simplest, most economical resin systems that are easiest to prepare and show good performance. Generally, polyesters exhibit somewhat limited thermal stability, chemical resistance, and process ability characteristics.

Vinylester

Even further improved polyester, it is a combination of polyester and epoxy. Its curing, handling and processing characteristics are those of polyester, and it exhibits higher test results in corrosion temperature resistance and strength and has higher cost. Modifications of the molecule have produced even higher properties.

Epoxy

Epoxy resin systems show extremely high three dimensional crosslink density which results to the best mechanical performance characteristics of all the resins. The most demanding strength/weight applications use epoxy almost exclusively. It has excellent strength and hardness, very good chemical heat and electrical resistance. Disadvantages include higher cost and processing difficulty. In epoxy resin systems quantities of resin and hardener need to be measured precisely. Also, often heat curing is required.



Dual laminate

Pipe and fitting with thermoplastic liner (PVC-C, PVC-U, PVDF, and PP etc.) are other regular products of NCS Company.



Size (mm)	Length (m)	Working pressure (bar)	Resin type	Joining System	Stiffness (pa)	Working temp (c)
15 to 3000	3-6-12	1 to 100	Epoxy	Taper	1250	40 to 150
			Vinylester	Flange	2500	
			Polyester	Butt weld	5000	
				O-ring	10000	

Product with higher and thermal properties could be designed and manufactured, as customer request



Fitting

Size and other production characteristics of fittings are same as pipes. The fittings will produce fully automated with special designed mold that gives better mechanical and operational properties. Also we can manufacture miter fittings as customer's request.

Elbow	Standard (22.5, 45, 90 degree)
Tee	Equal , Reduced and Y type
Reducer	Eccentric and Concentric
Flange	Fixed, Loose, Heavy duty and Blind
Cap	



Joining system

All of the suggested methods will ensure the proper working of products on designing conditions. There are two main group of joining system: fixed and flexible.

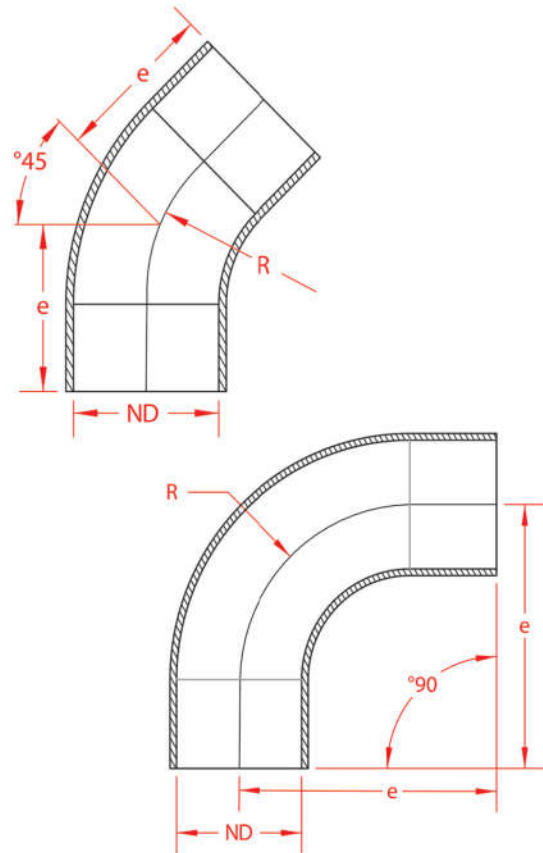
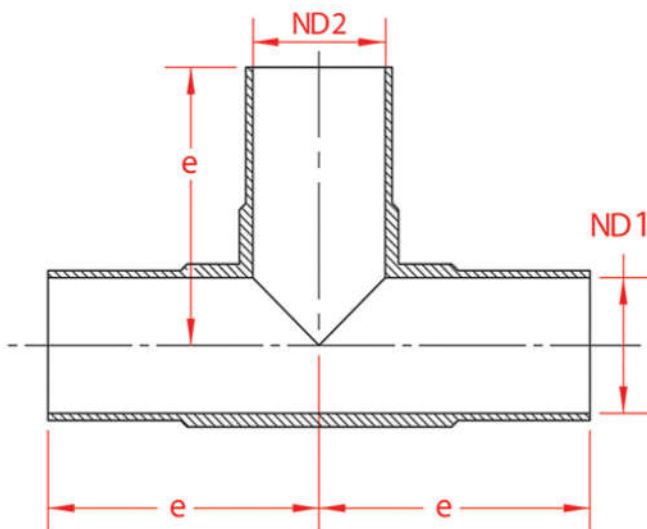
Flexible: will not transfer the axial load and pipes could be angled to a limited range.

Fixed: transferring the axial load, movement and rotation. Jointed pipes have the same condition after joining. It is used in high pressure applications.

Storage tank,Vessel and Scrubbers

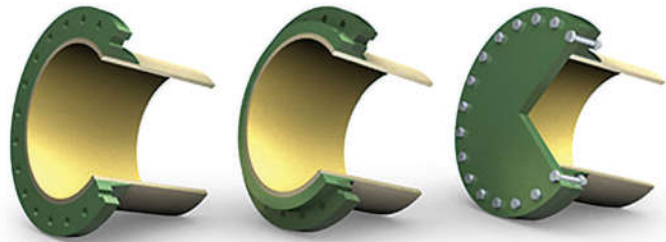
We can manufacture different types and sizes of tank (process and storage), duct, vessel and scrubber.

ND1 (mm)	ND2 (mm)
15	15
20	20-15
25	25-20-15
32	32-25-20-15
40	40-32-25-20
50	50-40-32-25
65	65-50-40-32
75	75-65-50-40-32
80	80-75-65-50-40
100	100-80-75-65-50
125	125-100-80-75-65-50
150	150-125-100-80-50
200	200-150-125-100-80
250	250-200-150-125-100
300	300-250-200-150-125-100
350	350-300-250-200-150
400	400-350-300-250-200-150
450	450-400-350-300-250-200
500	500-450-400-350-300-250
550	550-500-450-400-350-300
600	600-500-450-400-350-300
700	700-600-500-450-400-350
750	750-700-600-500-450-400
800	800-750-700-600-500-450-400
900	900-800-750-700-600-500-450
1000	1000-900-800-750-700-600-500



INCH	ND (mm)	R (mm)	e (mm)	
			45°	90°
1	25	72	70	110
1 1/4	32	88	80	130
1 1/2	40	104	90	150
2	50	71	105	180
2 1/2	65	84	85	140
3	80	105	100	165
4	100	136	115	205
5	125	162	135	245
6	150	192	150	284
8	200	275	190	365
10	250	350	225	450
12	300	402	260	525
14	350	463	290	600
16	400	529	325	680
20	500	654	390	830
24	600	750	430	950
28	700	850	490	1100
30	750	750	550	1150
32	800	800	571	1200
36	900	900	613	1250
40	1000	1000	654	1300

Inch	ND1 (mm)	ND2 (mm)	L (mm)
1 1/4	32	25	18
1 1/2	40	32	21
		25	39
2	50	40	26
		32	47
		25	65
		20	86
2 1/2	65	50	39
		40	65
		32	86
		25	104
3	80	65	39
		50	78
		40	104
		32	130
4	100	80	52
		65	91
		50	130
		40	156
5	125	100	65
		80	117
		65	156
		50	182
6	150	125	65
		100	130
		80	182
		65	211
8	200	150	130
		125	195
		100	260
		80	325
10	250	200	130
		150	260
		125	325
		100	390
12	300	250	130
		200	260
		150	390
		125	455
14	350	300	130
		250	260
		200	390
		150	455
16	400	350	130
		300	260
		250	390
		200	455
20	500	400	260
		350	390
		300	520
		250	650
24	600	500	260
		400	520
		350	650
		300	780
28	700	600	260
		500	520
		400	650
		300	780



Flang

Type of flange:

- Fixed flange
- Loos flange
- Blind flange

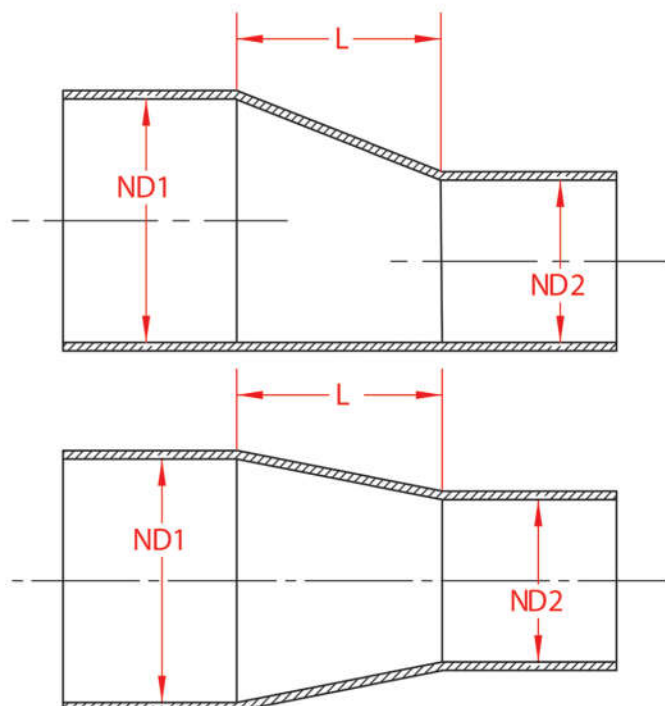
Drilling standard based on costumer request:

- ANSI/ASME
- DIN

Based on the project requirement, the composite back ring could be used in loose flange.

The customer can request every joining system for flange neck based on their project requirement.

Reducer (Ecc & CC)





GRP PIPES INSTALLATION

- Installation and supporting of pipelines.
- Shop and filed spool workshop.
- Miter fittings on site.



Manufacturing method

NCS uses filament winding method for pipes in accordance with AWWA, ASME, API, ISO, ASTM and BSI standards. Size and mechanical, physical and chemical properties of the products are mentioned in these standards. Other composite structures will be produced using the best method in accordance with the customer's criteria

Advantages of the Manufacturing method

1. High strength to weight ratio is possible to achieve with this process.
2. High degree of uniformity in fiber distribution, orientation and placement.
3. Labor involvement is minimal as it is an automated process.
4. Filament winding method is suitable to process composite parts requiring precise tolerances.
5. Fiber orientation in a specific direction is possible in this process.



6. Cost of the composite part processed through filament winding method is substantially low as compared to other manufacturing methods as this process involves less and low cost material to produce high strength component.
7. Design flexibility in composite part is possible with the change in winding patterns, material and curing option.
8. The size of the component is not restricted.
9. For high production volume, process automation results in cost saving.

Quality control and Laboratory

Before stocking, during process and after manufacturing products, the Lab and QC team will check the quality based on the international standards and costumers requirements.

Qualification Testing

- Long Term Testing

Strain corrosion test – ASTM D 3681

Hydrostatic design basis – ASTM D 2992

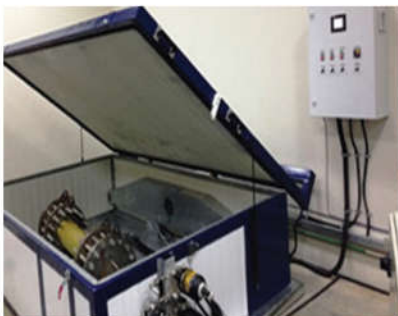
- Short/Medium Term Testing

Hydraulic failure pressure of pipes and fittings –ASTM D 1599



Strain corrosion (Long term corrosion test)

The strain corrosion testing is carried out in accordance with ASTM D3681, and requires a minimum of 18 ring samples of the pipe to be deflected to various levels and held constant. These strained rings are then exposed at the invert of the interior surface to corrosive media. The time to failure (leakage) for each test sample is measured. The minimum extrapolated failure strain at 50 years, using a least squares regression analysis of the failure data, must equal the values shown for each stiffness class



Physical property	Unit	Value	Test method
Thermal conductivity pipe wall	w/m°K	0.33	-
Thermal expansion	mm/mm°C	1.80E-05	-
Flow coefficient	Hazen-williams	150	-
Density	kg/m3	1800	-
Poisson's ratio	-	0.4	D2105
Barcol hardness	barcol	45	-

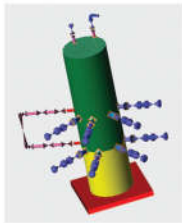
Mechanical properties	Unit	Value	Test method
Axial tensile strength	Mpa	80	D2105
Axial tensile modulus	Gpa	12.5	D2105
Axial bending strength (beam)	Mpa	80	-
HDB	Mpa	148	D2992
Hoop tensile strength	Mpa	380	D2290
Hoop tensile modulus	Gpa	23.25	D2291

Hydrostatic design basis (HDB)

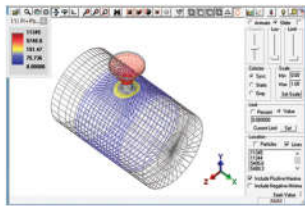
Pipes are subjected to varying levels of internal pressure and the time to failure is measured. This data is then extrapolated to a rating point from which the pipe design can be established. The failure data is extrapolated to 50 years to establish a design value. The 50-year value—often termed the hydrostatic design basis—is not the expected life of the product, but rather serves as a point from which, after the application of appropriate long-term safety factors, the product design can be determined. The expected life of the product is considerably longer.



Navisworks Review Model



CAESAR II Modeling & Piping Stress Analysis



FEA Analysis of nozzles on Nozzle Pro

Epoxy adhesives

Epoxy is a common term used for strong adhesives which are required to be used for bonding two materials or surfaces together. Epoxy Adhesives are usually two component systems, i.e., two compounds (resins) that need to be mixed together and cured either at room temperature or at elevated temperatures. Epoxy Adhesives can be customized to suit the requirement for an application.

NCS epoxy adhesives characteristics:

- Strong bonding of Metal/composite for aerospace applications
- No need to surface preparation
- Under water cure adhesives
- Very good chemical resistance specially on oil fields
- High temperature resistance applications
- Single part epoxy adhesives

Engineering and site services

NCS offers a wide range of services to his costumers including,

- Engineering:
- Complete analysis of costumer operating conditions
- Designing the complete pipelines and equipment based on the project requirements
- Stress analysis of the pipelines and equipment
- Hydraulic analysis of the pipelines
- Supporting design

Project

- Site execution of pipe line and piping.
- Project control services (time, execution, price analysis).
- Preparing the work break down structure (WBS) for execution.
- On site manufacturing of special products or shortage.
- Repair and Maintenance of piping and equipment.



As per ASTM D 638



As per ASTM D 2105



Stiffness Test



Hoop Tensile Test



Novin Composite Sadra

Producer of composite parts in Aerospace , Oil
Gas , and Petrochemical industries
Supplier of raw material in composite industries

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