【ACT TAPE SYSTEMS】

1. INTRODUCTION

The ACT TAPE SYSTEM is an anticorrosive and waterproofing system that uses nonwoven cloth tape impregnated with a liquid resin compound (ACT TAPE). In addition to the application of primer and a top coat, wrapping ACT TAPE around or affixing it to a pipe or heat insulator protects the pipe or heat insulator against corrosion and water over a long period of time. First, let's look at the characteristics of the ACT TAPE SYSTEM in terms of applications.

Applications intended primarily for heavy corrosion prevention consist of the following four processes. Of these processes, only the wrapping (or affixing) process (3) is significantly different from the general painting process. (Refer to Fig. 1.)

(1) Prepare the base surface.
(2) Apply a primer and allow it to dry completely.
(3) Wrap or affix ACT TAPE impregnated with a liquid compound made from finely dispersed and mixed resin, corrosion-inhibiting pigment, and solvent.
(4) Apply a top coat.

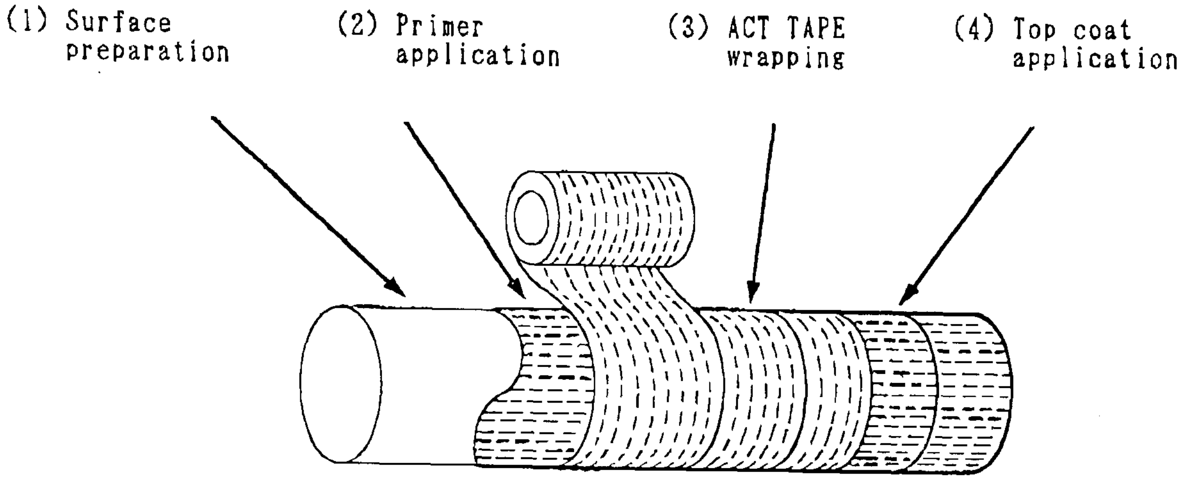

Fig. 1: Application of the ACT TAPE SYSTEM

Since the liquid compound contains a solvent, the ACT TAPE is very flexible and easy to work with. As the solvent evaporates after application, the ACT TAPE gradually hardens and becomes integrated with a prime coat and a top coat, forming a very thick coating.

2. TYPES OF ACT TAPES

The ACT TAPE can be roughly classified into two types according to its functional properties: the anticorrosive type and the waterproofing type. ACT TAPE is applied either directly to metals for corrosion prevention or over heat insulators for waterproofing.

Corrosion-proofing type

Above-ground use (1) ACT TAPE 100 (Heat resistance up to 100°C)

(2) ACT TAPE 200 (Heat resistance up to 200°C)

Underground use (3) ACT TAPE U (Estimated heat resistance up to 100°C)

Waterproofing type

Lagging (a substitute for sheet metal working)

(4) ACT TAPE L (Heat resistance up to 100°C)

Rainwater sealing around tank bottoms

(5) ACT TAPE W

(1) Each type consists of two sections: the primer and the ACT TAPE. The material specifications are available for review.

(2) The standard application specifications and illustrations are also available.

3. ACT TAPE 100 AND 200 SYSTEMS

Two types of anticorrosive tape are available for above-ground use: ACT TAPE 100 and ACT TAPE 200. Although these tapes have different heat-resistance properties, they exhibit the same corrosion prevention properties.

3.1 Corrosion Prevention Functions and Features

Traditionally, the following methods have been used for heavy corrosion prevention: (1) the painting system, (2) petrolatum corrosion-inhibiting tape, or (3) resin heat-resisting and corrosion-inhibiting tape. The ACT TAPE SYSTEMS fall into the third category.

Generally, rust is generated by the electrochemical reaction of water with oxygen in the atmosphere. Therefore, to prevent rusting, measures to prevent the intrusion of oxygen and water and to inhibit the reaction process (for example, by passivating) are necessary. The primer, the compound impregnated in the tape, and the top coat are all constituents of the ACT TAPE SYSTEM. The system uses highly hydrophobic resins, such as alkyd resin, acrylic resin, and silicone resin, as the principal components in the prevention of the entrance of water. These resins cross-link with each other over time, bringing all films closer to each other. The system's corrosion-inhibiting pigment performs as a passivator, while squamiform aluminium acts as a sacrificial anode, prevents the entrance of air, and intercepts ultraviolet rays to prevent the deterioration of the resins. Both the waterproofing and the electrochemical corrosion prevention properties increase as the coating thickens.
The nonwoven cloth of the ACT TAPE not only increases coating thickness, but also improves the mechanical strength of the coating. The ACT TAPE SYSTEM, ther efore, is a total corrosion-proofing system.

Especially important features of ACT TAPE 100 and 200 are as follows.

a) Easy application

If a material is difficult to apply, it cannot perform to its full potential. ACT TAPE 100 and 200 remain highly flexible and easy to work with for many hours. ACT TAPE 100 and 200 remain highly flexible and easy to work with for many hours. Smoothing out or rewinding the tape to remove bubbles, or affixing the tape to deformed sections can be done quite easily.

Accordingly, application mistakes are decreased and application time is significantly reduced.

b) Environmentally safe pigment

In accordance with the worldwide trend toward environmental protection, lead and chrome corrosion-inhibiting pigments are not used in our products.

3.2 Comparison with the Painting System

(a) The primer, liquid compound, and top coat have a similar function. After application, they integrate with each other as the solvent evaporates and finally harden. Because the foundation cloth is solidified and sandwiched between the primer and top coat, a mechanically strong and thermally efficient coating is obtained.

The film that is produced by the general painting system is rather thin, so it is mechanically weaker and therefore more vulnerable to damage.

(b) Clearly, the thicker a film is, the greater its corrosion prevention qualities. Film thickness in the painting system varies, and is mainly determined by the number of coats applied. In other words, if a highly corrosive surface is to be painted, the number of coats applied must be increased, which lengthens the application and curing times. Normally, one coat of paint produces a film about 30 microns thick, but even if six or seven coats are applied, it is only possible to produce a film 400 microns thick. With the tape system, the winding process (apart from the coating processes which take place before and after the winding process) can produce a coating as thick as 400 microns (single winding) or 800 microns (double winding).

(c) A great deal of skill is required to produce a film of uniform thickness by painting. With the tape system, which uses a foundation cloth of uniform thickness, producing a uniformly thick coating is easy.

(d) Film thickness on the corners of H-steel, for instance, is considerably less than in other area, so areas such as these are more likely to rust. In cases such as this, tape that produces a uniformly thick coating, regardless of location, is advantageous.

(e) With the painting system, once rusting begins underneath the paint, the rust expands laterally, which raises the film from the inside and accelerates the rusting process. For this reason, rust spots that appear insignificant may make it necessary to repaint the entire surface. In contrast, the foundation cloth of the ACT TAPE protects the entire coating very effectively. As a result, rust does not expand in the transverse direction, and this makes repairs much easier.

(f) Rust is likely to reappear in the same spot even after the surface has been treated and repainted. This is a weakness of the painting system, and can be attributed to surface unevenness produced by rusting, the tendency of rust to set trapped in the concave areas of a surface, and the fact that film cannot be made thick enough on the convex area of a surface. On the other hand, the ACT TAPE SYSTEM 5 rust transformer removes rust in the concavities of a surface and the tape forms a thick coating that is far less susceptible to corrosion.

(g) Paint requires a curing time of more than a day after each coat is applied (though this varies depending on the paint). This not only increases labor time but also may subject the painted surfaces to severe conditions during the curing period, depending on the painting site. With the ACT TAPE SYSTEM, however, the curing time is reduced to within several hours, thus shortening the application time and reducing the likelihood of surfaces being subjected to adverse conditions during application.

3.3 Comparison with Petrolatum Tape

Anti-corrosive tape impregnated with petrolatum has traditionally been used because it is soft, produces a thick coating, and is easy to apply. Petrolatum tape is similar to the ACT TAPE System's tape, but the petrolatum tape differs from the ACT TAPE in that the petrolatum tape does not contain a solvent. The following are the primary differences between the two tape systems.

(a) Petrolatum tape easily softens, fluidizes, discolors and deteriorates when subjected to heat. In contrast, ACT TAPE features high heat-resistance properties, since its main constituent is resin.

(b) Petrolatum tape makes surfaces sticky, cracked or blackened when exposed to ultraviolet rays. ACT TAPE, on the other hand, is highly durable and hardens gradually, so cracking and discoloration are much less likely.

(c) Resin-based tape firmly adheres to metal surfaces and is particularly effective when affixed to vertical metal surfaces.

(d) Petrolatum tape is highly water-repellant and is mainly designed to intercept water and air, while resin tape consists of a composite anti-corrosive mechanism, as was previously mentioned, and features superior corrosion-prevention performance. Once water enters, corrosion expands laterally through the petrolatum tape, thereby accelerating the corrosion process, whereas ACT TAPE significantly inhibits corrosion.

(e) Colored petrolatum tape often conceals the rust that is generated inside it, which can be considered the Achilles' heel of petrolatum tape. In contrast, the silver-colored resin ACT TAPE makes the presence of rust obvious by allowing a rust-colored liquid (rust stain) to seep through the tape from the point at which rust has formed.

3.4 Test Results

Test Results of ACT TAPE 100

The ACT TAPE SYSTEM's excellent performance can only be obtained when all of its physical and mechanical properties are well integrated with each other. We prepared test samples in accordance with standard application specifications and determined each physical and mechanical values as follows.

No	Test Items	Test Method	Result
1	Cyclic test of salt spraying, drying, and wetting	Salt spraying → Drying → Wetting, 200 cycles 2 h → 60°C x 4 h → 95% RH x 2 h	Neither rusting nor bulging occurred. A very little rust formed on the cut surfaces.
2	Outdoor exposure test	JIS K5400 SUNSHINE-WETHER-METER/1000 h	No abnormalities were observed.
3	Salt spraying test	JIS Z2371/3000 h	No abnormalities were observed.
4	Surface insulation resistivity	ASTM D257	3.8×10^{11} Ω
5	Volume insulation resistivity	ASTM D257	8.2×10^{11} Ω
6	Breakdown voltage	JIS C2103	70.1 kv/0.1 mm
7	Tensile strength	ASTM D2370	93 kgf/cm^2
8	Elongation after tensile fracture	ASTM D2370	33.6%
9	Tape peel strength	JIS Z0237, 90 deg peeling	12.0 kgf (20°C)
10	Hardness	ASTM D3363	6H min.
11	Impact resistance	JIS K5400, DuPont method/300 g x 50 cm	Neither cracking nor peeling occurred.
12	Wear resistance	ASTM D4060/Load: 500 g x 2	138 mg (1000 revolutions)
13	Water absorption	JIS K7209	0.46%
14	Chemical resistance test*1	Apply the following solution to the taped surface, then check for conductivity and rust formation.	Conductivity*2 / Rusting
		10% sulfuric acid solution	After 30 days / None / None
		10% hydrochloric acid solution	After 30 days / None / None
		5% caustic soda solution	After 30 days / None / None
		5% brine solution	After 30 days / None / None
		Xylene	After 10 days / None / None
		n-heptane	After 10 days / None / None
		Methyl isobutyl ketone	After 10 days / None / None
		Ethyle acetate	After 10 days / None / None

*1 Place the taped surface of the iron plate in each chemical and leave it for a fixed time (supplement the chemical after it is volatized), then check its conductivity by measuring volume resistivity (measure solvents by substituting them for water), and check visually for rust formation.

*2 Conductivity was determined to be nil since resistivity was greater than 1×10^7 Ω·cm and rusting did not occur.

* Figures in the table are test results, not guaranteed values.

* Figures may change if further improvements are made.

Test Results of ACT TAPE 200

The ACT TAPE SYSTEM's excellent performance can only be obtained when all of its physical and mechanical properties are well integrated with each other. We prepared test samples in accordance with standard application specifications and determined each physical and mechanical values as follows.

No	Test Items	Test Method	Result
1	Heat-resistance test	230°C x 250 h 210°C x 650 h	No abnormalities were observed. No abnormalities were observed.
2	Cyclic test of heating and quenching	210°C x 100 hr → quench in water (10°C), 6 cycles	No abnormalities were observed.
3	Watertightness test	Check for water permeability after 230°C x 250 hr	No water permeated (continuously for 7 days).
4	Cyclic test of salt spraying, drying, and wetting	Salt spraying → Drying → Wetting, 65 cycles 2 h → 60°C x 4 h → 95% RH x 2 h	No abnormalities were observed.
5	Outdoor exposure test	JIS K5400 SUNSHINE-WETHER-METER/500 h	No abnormalities were observed.
6	Salt spraying test	JIS Z2371/1000 h	No abnormalities were observed.
7	Surface insulation resistivity	ASTM D257	7.8×10^{11} Ω
8	Volume insulation resistivity	ASTM D257	1.5×10^{12} Ω cm
9	Breakdown voltage	JIS C2103	45.5 kv/0.1 mm
10	Tensile strength	ASTM D2370	31 kgf/cm^2
11	Elongation after tensile fracture	ASTM D2370	14.3%
12	Tape peel strength	JIS Z0237, 90 deg peeling	17.8 kgf (20°C)
13	Hardness	ASTM D3363	6H min.
14	Impact resistance	JIS K5400, DuPont method/300 g x 50 cm	Neither cracking nor peeling occurre
15	Wear resistance	ASTM D4060/Load: 500 g x 2	121 mg (1000 revolutions)

* The results in the table were obtained by conducting tests. They are not a guarantee of performance.
* Figures may change if further improvements are made.

4. ACT TAPE U SYSTEM

Corrosion protection for underground pipes is quite different from corrosion protection for pipes installed aboveground as a result of differences in the ambient environment. For instance, soil condition varies from location to location as a result of differences in rainfall levels and other factors. In addition, some soil contains groundwater, stray current, or bacteria. Also, electrolytic protection may be required in some underground locations, and installation and repair work are more difficult for underground pipes. For these reasons, both a proper corrosion-proofing material and an application system that feature long-term durability are required. In general, easy way to find a proper anticorrosive material is to conduct acceleration tests under the most severe conditions that are possible at the site in question. Of the acceleration tests, those generally considered to be the most important are (1) the water tightness test, in which the anticorrosive material is immersed in water over a long period, and (2) the peeling test (cathode peeling test)*, when electrolytic protection is to be provided. These tests are important in that corrosion hardly ever occurs under dry conditions even underground.

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* Since damage to the coating by human error in application is unavoidable, electrolytic protection is also provided in some cases. When dealing with underground pipes, since the coating deteriorates and is likely to peel off, sufficient durability and adhesion are required even when electrolytic protection is also provided. Therefore, tests (1) and (2) are important.

Overseas markets, in particular, require high-temperature rust-preventive materials that can withstand very severe environmental conditions in which pipe temperatures exceed 80°C.

For such circumstances, a rust-preventive material that can withstand high temperatures, ACT TAPE U, was developed specifically for its properties of 1) water-tightness and 2) resistance to cathode peeling. The following section briefly explains 1) ACT TAPE U's corrosion-preventive functions and features, 2) the watertightness test, 3) the cathode peeling test, 4) methods of preventing human error, and 5) the test results.

4.1 Anti-corrosive Preventive Functions and Features

The anticorrosive functions of ACT TAPE U are basically the same as those of ACT TAPE 100 or 200. Its main constituents are a special hydrophobic rubber that prevents the entrance of oxygen and water, gilsonite, and an environmentally safe pigment which performs as a passivator.

Pipes that are installed in excavated underground areas may be immersed in water for long periods of time and are therefore in danger of corroding.

Consequently, it is important that the inside of the tape is uniformly integrated to prevent corrosion. In addition, the foundation of ACT TAPE U is made of net woven cloth so that micro bubbles do not form inside the tape during the application process. The primer is designed to be applied underneath the tape. One important feature of ACT TAPE U is its reduced application time which results from the quick drying of the primer.

4.2 Watertightness Test

Regardless of whether the tape used is corrosion-preventive, a coating, when immersed in water for long periods, generally permits the entrance of water, which eventually results in rust formation. Monitoring the advancement of rust is important during this period. We examined the rusting process by measuring electric insulation resistance values. Figure 2 shows the test device we used to conduct the water tightness test.

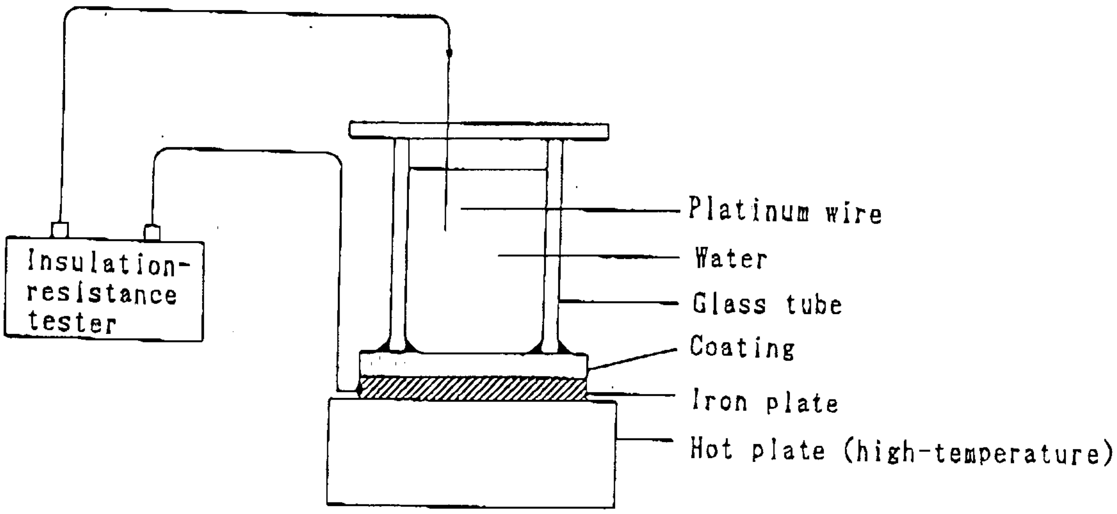


Fig. 2: Water tightness test device

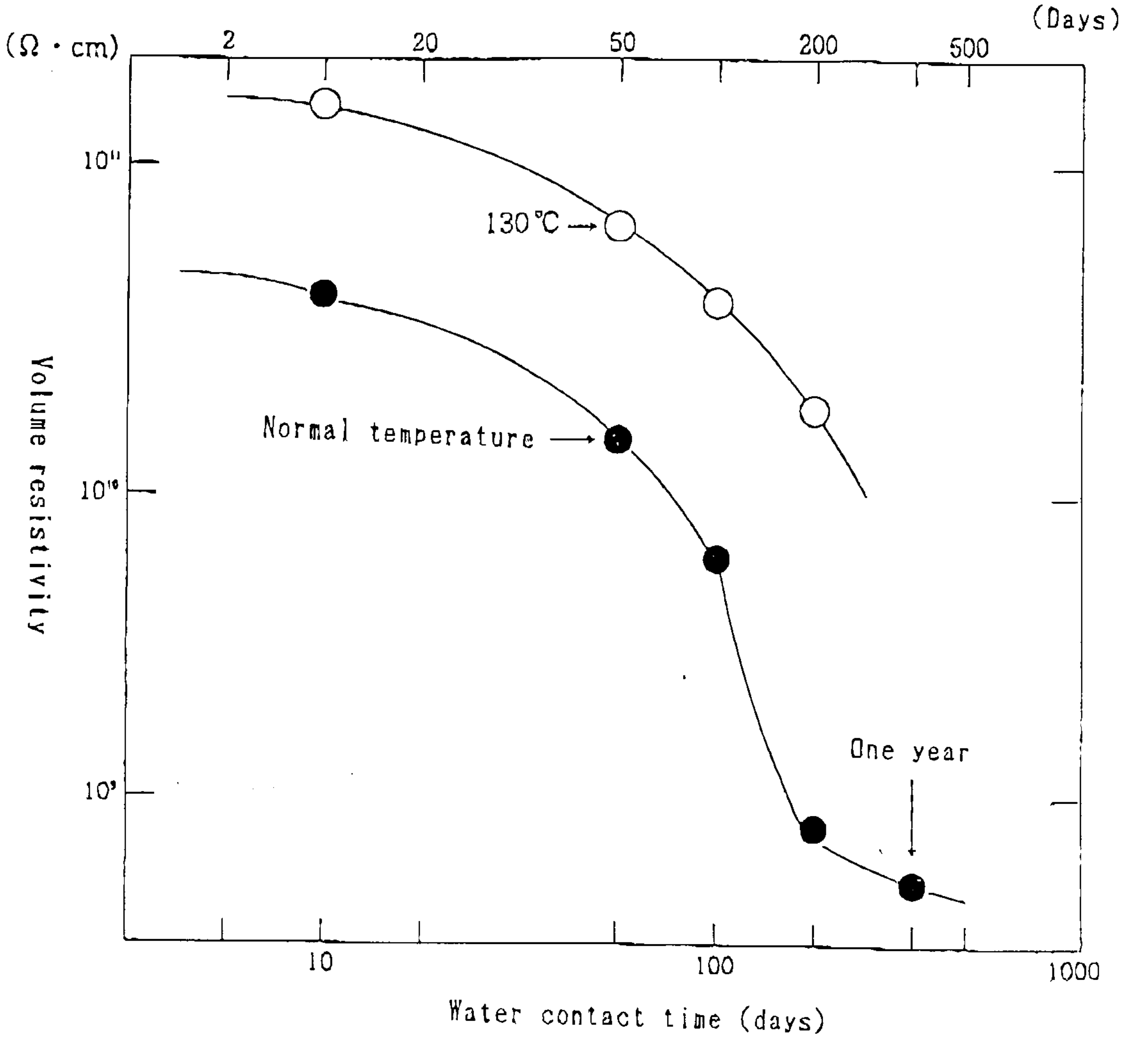


Fig. 3: Changes in electric insulation resistance over time during the water tightness test

The water tightness test in which the test sample was immensed in normal temperature water for one year, revealed no rust development, and volume resistivity remained relatively high and stable throughout the test period. When the iron plate was continuously heated to 130°C (water temperature: minimum of 90°C), volume resistivity did not decrease significantly after a period of 6 months. Therefore, ACT TAPE U appears to be suitable for high-temperature underground pipes.

4.3 Cathode Peeling Test

The adherence of a coating to metal is quite important in terms of corrosion prevention, but the combined use of the tape system and the electrolytic protection technique makes the coating more susceptible to peeling. However, the results of the cathode peeling test, which was conducted under severe conditions, made it clear that ACT TAPE U adheres sufficiently to metal surfaces, leading us to conclude that ACT TAPE U is effective even when it is not used in conjunction with electrolytic protection.

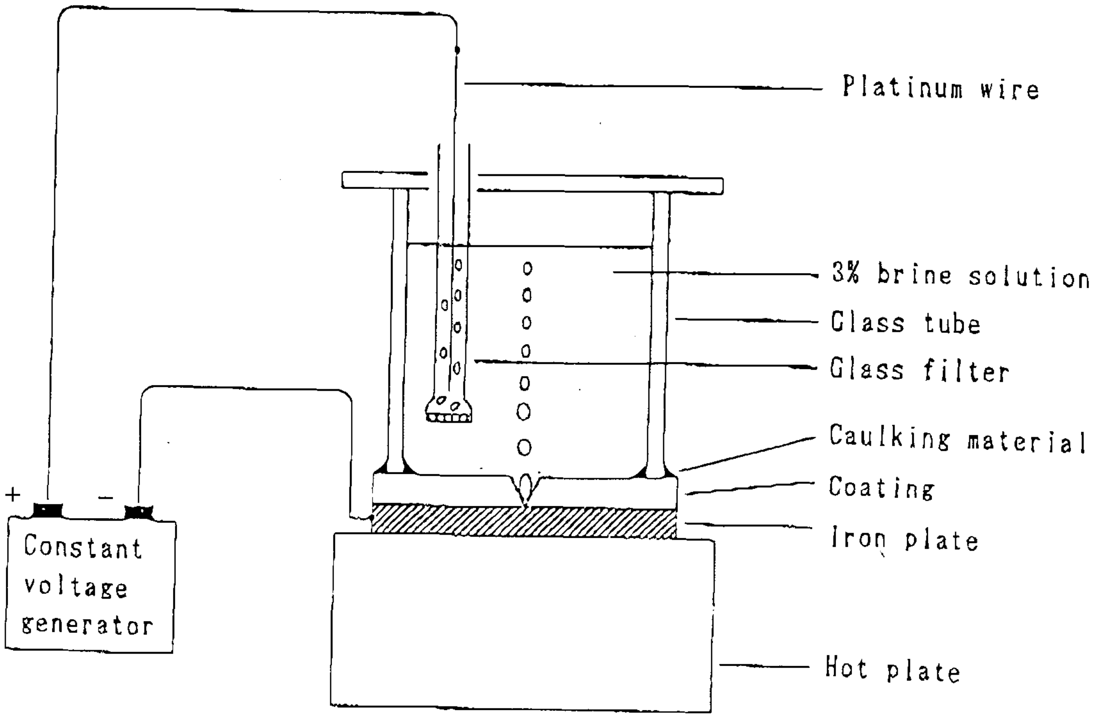


Fig. 3: Cathode peeling test device (The device, referenced by J.A. Numm in the Oil & Gas Journal, May 11, 1987, is in accordance with ASTM G-8.)

Prepare a small "holiday" (an uncoated area or pinhole) in the center of the metal surface of a coated test sample, and set it as illustrated in Fig. 3. After the application of a brine solution to simulate a coastal underground environment, apply the voltage (3 volts), assuming there is electrolytic protection. The brine solution reacts electrochemically and changes to a caustic soda aqueous solution (pH: 12 min.). Gaseous hydrogen emanates from the small holiday, and chlorine gas followed by oxygen is generated by the platinum wire. The coating is placed in the strong alkaline atmosphere, and the tape is raised through the continuous generation of gaseous hydrogen. In this way, the coating's adhesion strength and resistance to strong alkaline are tested. A more severe acceleration test technique is required to test higher-temperature underground pipes which exceed 130°C, since the temperature of a caustic soda aqueous solution also reaches high levels (more than 90°C).

The results of the cathode peeling test of ACT TAPE U are compared below with the results for fusion-bonded epoxy, which was judged to be satisfactory in the above-mentioned reference (by J.A. Nunn in the Oil & Gas Journal, May 11, 1987).

	Test Condition	Results (peeled radius)
ACT TAPE U	Normal temperature x 1 month	0.0 cm
	130°C x 1 week	1.0 cm
Fusion-bonded epoxy	93°C x 1 week	0 - 1.2 cm

From the above results, we concluded that ACT TAPE U adheres relatively well even at high temperatures.

4.4 Prevention of Human Error

It is difficult to completely eliminate human error during the application process, transport, retouching of welds, and installation of underground pipe. However, work that is almost completely free of human error can be expected if these conditions are met: 1) A proper method of detecting human error must be available; 2) Short-time site repairs must be possible; 3) Quick burial of pipes

must be possible due to fast drying time; and 4) Damage to pipes by soil and rocks during burial must be preventable.
Immediately before pipes are buried, the ACT TAPE U SYSTEM makes it easy to 1) measure the minimum coating thickness through the use of a coating thickness meter; and 2) check for the presence and location of the pinhole, bubble, and dent through the use of a pinhole tester. Moreover, since the primer (UP) used demonstrates excellent workability and drying properties, it is possible to retouch quickly on-site. The combined use of ACT TAPE U and an appropriate protective sheet to prevent damage by soil and rocks during burial makes application work free of human error possible.

The possibility of attaining application performance free of human error and the high level of water tightness and acid resistance of the coating itself (see paragraph 4.2 and 4.5) eliminate the need to simultaneously provide electrolytic protection. Even when electrolytic protection is provided simultaneously, no cathode peeling occurs because the coating is free of damage, so such a high level of adhesion is not required. In other words, for the ACT TAPE U SYSTEM, the water tightness test is more important than the cathode peeling test. From the standpoint that water tightness is relatively good at 130°C, as well as at normal temperatures, the ACT TAPE U SYSTEM appears to be effective in preventing corrosion at high temperatures as well.

4.5 Test Results

5. ACT TAPE L SYSTEM

The lagging material that is used to cover a heat insulator for heating pipe must prevent the entry and exit of air to create a better insulation effect, and must also protect the heat insulator, prevent the entrance of rainfall, and provide a neat appearance. Sheet metal processing, which has generally been employed, is far from satisfactory in this regard.

The ACT TAPE L SYSTEM is the resin tape water-proofing system developed to eliminate the problems of conventional sheet metal processing. The ACT TAPE L SYSTEM's materials and application method are significantly different from those of the conventional sheet metal technique. The following briefly described 1) the material composition and application method, 2) a comparison of sheet metal and ACT TAPE L SYSTEM, and 3) the test results.

5.1 Material Composition and Application Method

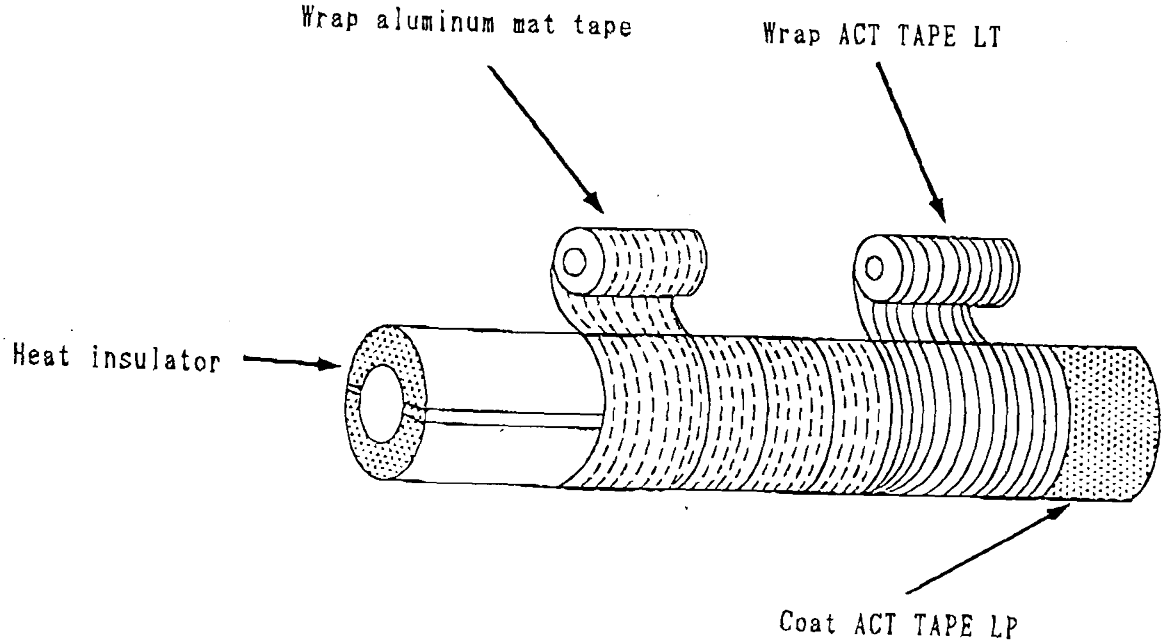
The ACT TAPE L SYSTEM consists of the following three materials. An aluminum pressure-sensitive adhesive tape and/or filler is also used as needed.

a) Aluminum mat tape: Protects the heat insulator and prevents the entrance of the liquid compound impregnated in the ACT TAPE LT into the heat insulator. (Applied by directly wrapping around the heat insulator.)

b) ACT TAPE LT: Waterproof tape impregnated with liquid compound. (Nonwoven cloth)

c) ACT TAPE LP: Overcoat.

These tapes are applied as described below. Wrap the aluminum mat tape first, then the ACT TAPE LT, and finally overcoat with the ACT TAPE LP.



Basic application procedure of the ACT TAPE L SYSTEM

For details, please refer to the material specifications and standard application specifications.

5.2 Comparison with the Sheet Metal

No	Comparison Items	Sheet Metal	ACT TAPE L SYSTEM
1	Material durability	Rust can occur. Poor performance in severe environments. Easily deformed or damaged.	Rust does not occur at all. Durable in adverse environments. (See chemical resistance) Soft and resistant to deformation or damage. (Standing on the tape does not break the tape.)
2	Waterproof	Incomplete coating. Waterproofing degrades over time. (Detachment due to expansion, contraction, or rust formation)	Nearly complete coating. Long-term waterproofing is ensured.
3	Moisture-proof	Nil (moisture enters through joints).	Relatively good moisture-proofing performance.
4	Air shutoff effect	Nil (air escapes through a space between the heat insulator and the sheet metal).	Very high (high heat insulating efficiency).
5	Heat conductivity	High (heat radiates from the sheet metal).	Lower than the sheet metal.
6	Workability	Difficult to cover deformed sections. Partial repairs are difficult.	Far better workability than the sheet metal. Easily repaired on-site.
7	Appearance	Easily contaminated by rust.	Good appearance is maintained over a long period.

a) With sheet metal processing, it is difficult to provide complete waterproofing. Moreover, the sheet metal vulnerable to deterioration over time. The sheet metal is therefore far more susceptible to the entrance of water, albeit only locally, than the ACT TAPE L SYSTEM.

b) The areas where water is admitted may not be clearly visible, but water max enter through these areas during every rainfall, corroding the inner pipe and degrading the heat-insulating effect.

c) The differences between the two systems may further widen over depending on ambient environmental conditions, the skill level of application and frequency of maintenance. Cold areas, areas vulnerable to wind and rain, or chemical plants featuring adverse environmental conditions increase the occurrence of corrosion or damage, making sheet metal more disadvantageous.

d) As for the heat insulating effect, the sheet metal becomes more disadvantageous as the difference between the outside and inside temperatures increases. From an energy-conservation standpoint, the ACT TAPE L SYSTEM is very advantageous.

5.3 Test Results

Test Results of ACT TAPE L

The ACT TAPE L SYSTEM's excellent performance can only be obtained when all of its physical and mechanical properties are well integrated with each other. We prepared test samples in accordance with standard application specifications and determined each physical and mechanical values as follows.

No	Test Items	Test Method	Result
1	Heat resistance test	130°C x 7 days	No cracks.
2	Outdoor exposure test	JIS A1415/SUNSHINE-WETHER-METER/500 h	No abnormalities were observed.
3	Salt spraying test	JIS Z2371/3000 h	No abnormalities were observed.
4	Surface insulation resistivity	ASTM D257	2.5×10^{11} Ω
5	Volume insulation resistivity	ASTM D257	5.8×10^{11} Ω cm
6	Breakdown voltage	JIS C2103	126.0 kv/0.1 mm
7	Tensile strength	ASTM D2370	141 kgf/cm^2
8	Elongation after tensile fracture	ASTM D2370	37.8%
9	Hardness	ASTM D3363	6H min.
10	Impact resistance	JIS K5400, DuPont method/300 g x 50 cm	Neither cracking nor peeling occurred.
11	Wear resistance	ASTM D4060/Load: 500 g x 2	106 mg (1000 revolutions)
12	Water absorption	JIS K7209	0.61%
13	Combustibility test	JIS A9514	Acceptable flame retardancy.
14	Chemical resistance test*1	Contact the taped surface with the following solution, then check for conductivity.	/ Conductivity*2 / Surface
		10% sulfuric acid solution	After 30 days / None / Discolored
		10% hydrochloric acid solution	After 30 days / None / Discolored
		5% caustic soda solution	After 30 days / None / Discolored
		5% brine solution	After 30 days / None / No abnormality
		Xylene	After 2 days / None / Partially cracked
		n-heptane	After 2 days / None / No abnormality
		Methyl isobutyl ketone	After 2 days / None / Partially bulged
		Ethyle acetate	After 2 days / None / Bulged or wrinkled

*1 Place the taped surface of the iron plate in each chemical and leave it for a fixed time (supplement the chemical after it is volatized), then check its conductivity by measuring volume resistivity (measure solvents by substituting them for water).

*2 Conductivity was determined to be nil, based on past experience, since the resistivity was more than 1×10^7 Ω·cm.

* Figures in the table are test results, not guaranteed values.

* Figures may change if further improvements are made.

MATERIAL SPECIFICATIONS

ACT TAPE SYSTEMS

ACT TAPE: ACT 100T

We guarantee that the contents and properties of the product used in the Act tape systems are as described below.

General category	Tape	
Uses	The tape used in conjunction with Act 100P and Act 100TOP. Act 100T is a material for making uniform layer of the corrosion protection on steel pipe and structures subjected to temperature up to 100℃.	
Contents	Polyester non-woven fabric impregnated with a dispersant composed of alkyd resin, acrylic resin, non-polluting anti-rust pigment, extender pigment, solvent, and additives.	
General characteristics	The tape has superior mechanical strength, adhesion strength, permeability resistance, and maintains prolonged corrosion resistance. Easy to apply by soft non-woven fabric .	
Properties	External appearance	Silver color, Roll
	Width	50mm . 100mm . 150mm . 200mm . 300mm
	Length	10m
	Thickness	～400 μ
	Weight *	＞0.65k g/ m^2
	Heat resistance	100℃
Packing	50mm × 10m : 36rolls per case 100mm × 10m : 18rolls per case 150mm × 10m : 12rolls per case 200mm × 10m : 9rolls per case 300mm × 10m : 6olls per case	
Shelf life	Within one year after delivery.	

* Quality control value

We will have changed the above date if an quality of product is improved.

MATERIAL SPECIFICATIONS

ACT TAPE SYSTEMS

ACT PRIMER : ACT 100P

We guarantee that the contents and properties of the product used in the Act tape systems are as described below.

General category	Primer	
Uses	The primer for the under coating and intermediate coat used in conjunction with Act 100T and Act 100TOP. Act 100P is a material for the corrosion protection of steel pipe and structures subjected to temperature up to 100℃.	
Contents	The main constituent are alkyd resin and acrylic resin, and it also contains non-polluting anti-rust pigment, extender pigment, solvent, and additives.	
General characteristics	The primer has superior anticorrosiveness, adhesion strength and flexibility, and maintains prolonged corrosion resistance .	
Properties	External appearance	Dark gray color, Liquid
	Nonvolatile component *	69.0±2.0 %
	Viscosity *	100± 50 PS
	Specific Gravity *	1.26±0.5
	Heat resistance	100℃
Packing	5Kg can : Four cans packed in one cardboard case. 20Kg can	
Shelf life	Within one year after delivery.	

* Quality control value

We will have changed the above date if an quality of product is improved.

MATERIAL SPECIFICATIONS

ACT TAPE SYSTEMS

ACT PRIMER : ACT 100TOP

We guarantee that the contents and properties of the product used in the Act tape systems are as described below.

General category	Primer		
Uses	The primer for topcoat used in conjunction with Act 100T and Act 100P. Act 100TOP is a material for making the weatherproof film on corrosion protection layer applied on steel pipe and structures subjected to temperature up to 100℃.		
Contents	Liquid A (Main agent)		Liquid B (Hardener)
	Nonrigid polyurethane-based acrylic resin, extender pigment, solvent, and additives .		Poly-isocyanate solvent-based hardening agent.
General characteristics	The primer has superior anticorrosiveness, chemical resistance, water resistance, adhesion strength, ultraviolet resistance and flexibility, and maintains prolonged corrosion resistance .		
Properties	External appearance	Silver color, Liquid	Colorless, Liquid.
	Nonvolatile component *	64±2 WT%	75±2 WT%
	Viscosity *	100± 50PS	
	Specific Gravity *	1.30±0.05	
	Heat resistance	100℃	
Packing	5Kg set : Liquid A (Main agent) 4.5Kg / can + Liquid B (Hardener) 0.5Kg / can Tow sets of 5Kg set is packed in one cardboard case. 20Kg set : Liquid A (Main agent) 18Kg / can + Liquid B (Hardener) 2Kg / can		
Shelf life	Within one year after delivery.		

* Quality control value

We will have changed the above date if an quality of product is improved.

MATERIAL SPECIFICATIONS

ACT TAPE SYSTEMS

ACT PRIMER : ACT 100MP

We guarantee that the contents and properties of the product used in the Act tape systems are as described below.

General category	Rust converter		
Uses	The primer for making passivation of rust used in conjunction with SSPC SP-2 (SIS St 2) in grade of surface preparation. Act 100MP is a material for the surface treating of steel pipe and structures subjected to temperature up to 100℃.		
Contents	Liquid A (Main agent)		Liquid B (Rust converter)
	Alkyd resin, and acrylic resin, non-polluting antirust pigment, extender pigment solvent, and additives.		Aqueous solution of phosphoric acid.
General characteristics	The primer has superior anticorrosiveness, adhesion strength and flexibility, and maintains prolonged corrosion resistance .		The rust converter makes passive film in black and control the grouth of a rust. Easy to penetrate to the bottom of pitting.
Properties	External appearance	Gray color, Liquid	Black color, Liquid.
	Nonvolatile component *	64±2 WT%	PH 0.1 or less
	Viscosity *	60± 20PS	
	Specific Gravity *	1.25±0.05	1.80±0.05
	Heat resistance	100℃	
Packing	5Kg set : Liquid A (Main agent) 4.5Kg / can + Liquid B (Hardener) 0.5Kg / can Tow sets of 5Kg set is packed in one cardboard case. 20Kg set : Liquid A (Main agent) 18Kg / can + Liquid B (Hardener) 2Kg / can		
Shelf life	Within one year after delivery.		

* Quality control value

MATERIAL SPECIFICATIONS

ACT TAPE SYSTEMS

ACT FILLER: ACT 100MAC

We guarantee that the contents and properties of the product used in the Act tape systems are as described below.

General category	Cement	
Uses	Act 100MAC used in conjunction with Act 100T, Act 100P and Act 100TOP. The filler for smoothing a part of uneven shape of which is pipe's flange and connections subjected to temperature up to 100℃.	
Contents	The main constituent is liquid syntheic rubber resin, and it also contains various pigment (including flame retarding pigments).	
General characteristics	The filler has superior adhesion strength and flexibility. Easy to apply by light specific gravity.	
Properties	External appearance	Gray color, Clay
	Nonvolatile component ＊	99.0±1.0 %
	Viscosity ＊	1000PS at 25℃
	Specific Gravity ＊	1.21±0.1
	Heat resistance	100℃
Packing	18Kg case (3Kg ×6bags)	
Shelf life	Within one year after delivery.	

＊ Quality control value

We will have changed the above date if an quality of product is improved.

MATERIAL SPECIFICATIONS

ACT TAPE SYSTEMS

ACT FILLER: ACT 100PTY

We guarantee that the contents and properties of the product used in the Act tape systems are as described below.

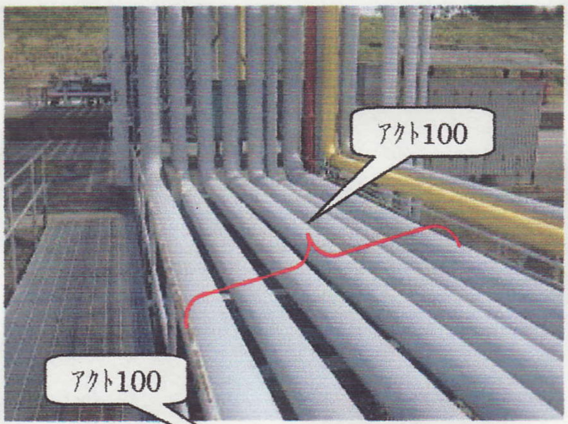
General category	Filler	
Uses	Act 100PTY used in conjunction with Act 300T, Act 100P, Act 100TOP and Act 100MP. The filler for smoothing an uneven surface of metal with pitting. Act 100PTY is a material for the surface preparation of steel pipe and structures subjected to temperature up to 100℃.	
Contents	The main constituent are alkyd resin and acrylic resin, and it also contains non-polluting anti-rust pigment, extender pigment, solvent, and additives.	
General characteristics	The filler has superior anticorrosiveness, adhesion strength and flexibility, and maintains prolonged corrosion resistance .	
Properties	External appearance	Silver color, Paste
	Nonvolatile component *	80.0±2.0 %
	Viscosity *	1000PS and over
	Specific Gravity *	1.50±0.2
	Heat resistance	100℃
Packing	5Kg can : Four cans packed in one cardboard case. 20Kg can	
Shelf life	Within one year after delivery.	

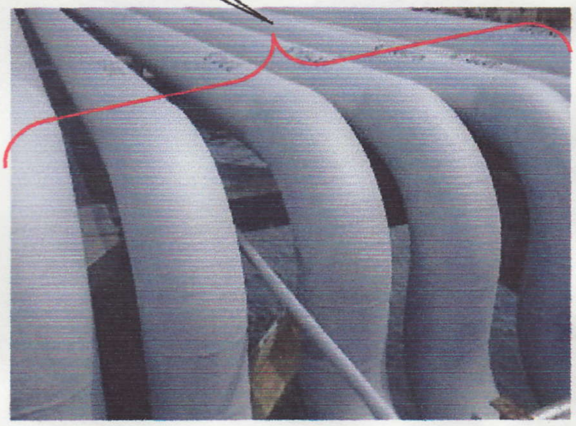
* Quality control value

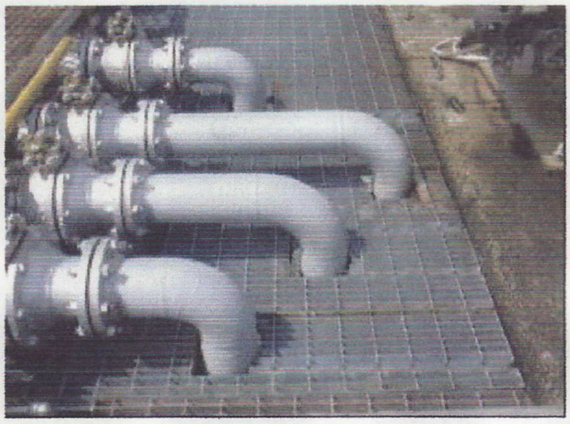
We will have changed the above date if an quality of product is improved.

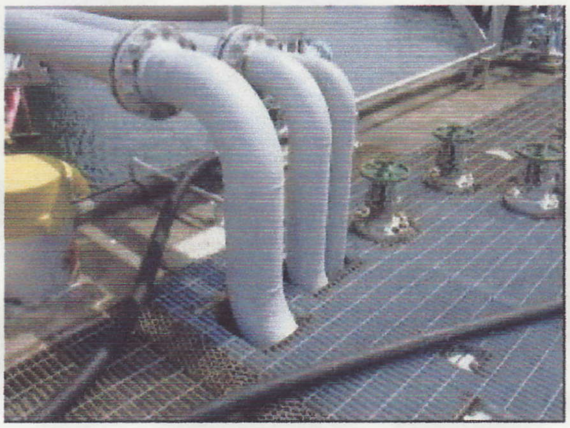
SITUATION IN 7 YEARS LATER AFTER INSTALLATION
AT BERTH IN REFINERY PLANT IN JAPAN

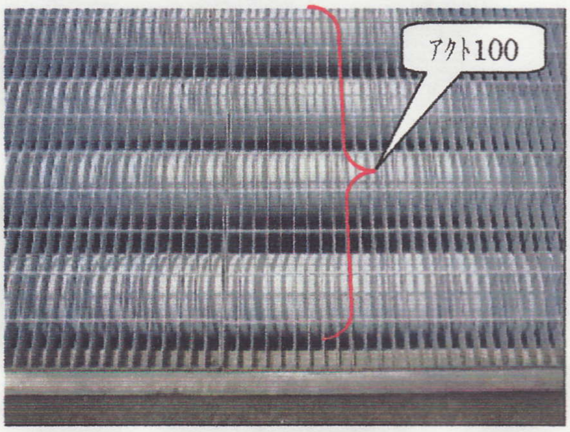
[INSTALLED: IN JULY ,1994] [PICTURE: 18 SEP., 2003]

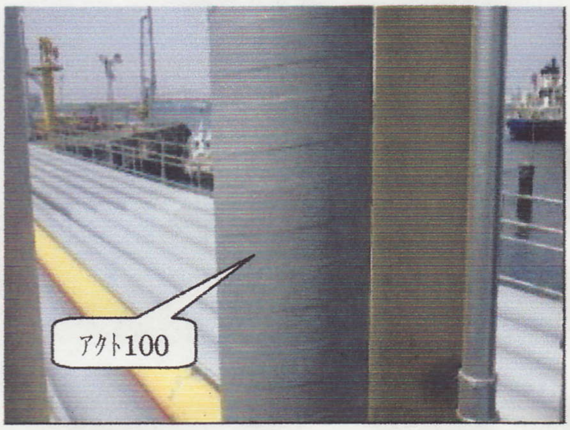








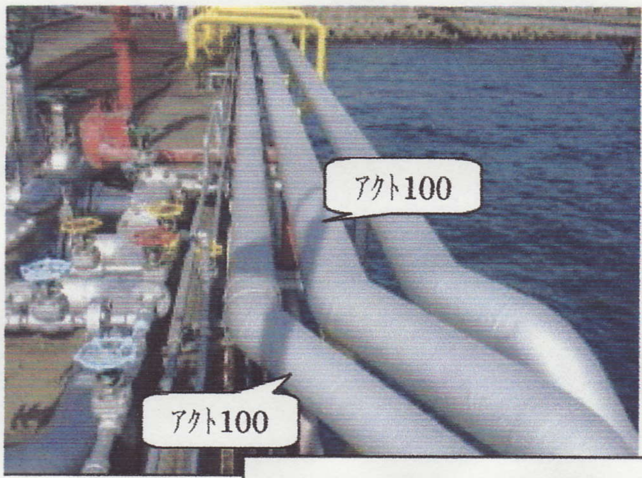


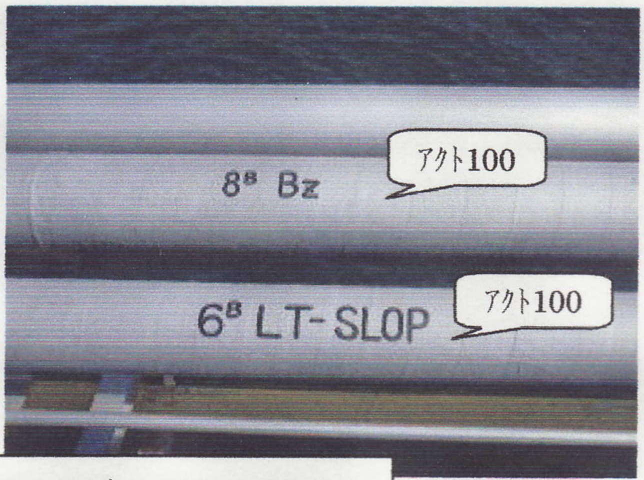


ACT-P1

AT INTERNAL ON REFINERY PLANT
PICTURES FOR ACT TAPE

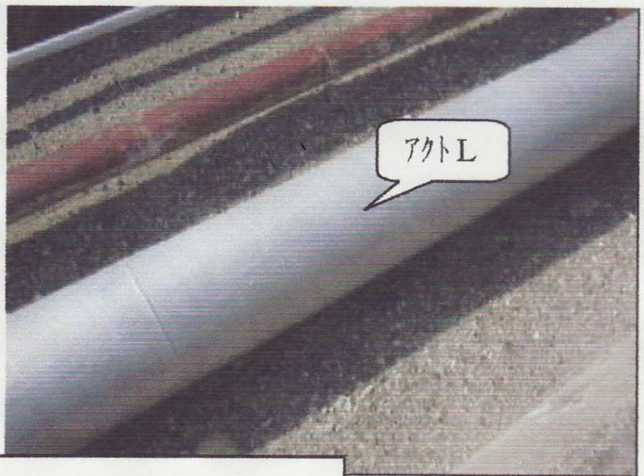
[PICTURES : 22 APR., 2003]





For Pipes at berth(ACT-100) : JUL, 1998

For heavy oil pipes(**ACT-100β**) : **Nov. 1997**



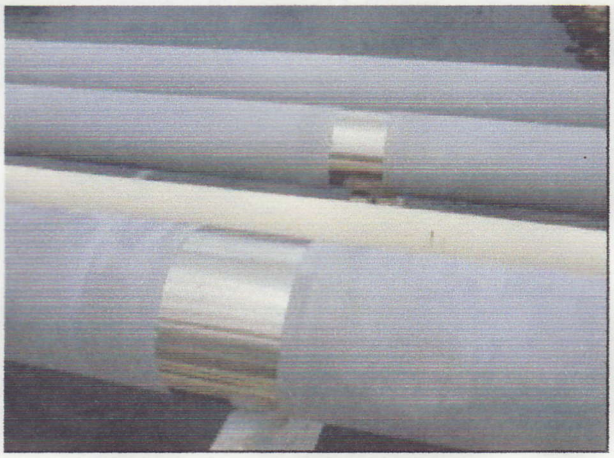
Pipes with insulator(ACT-L) : Sep1996

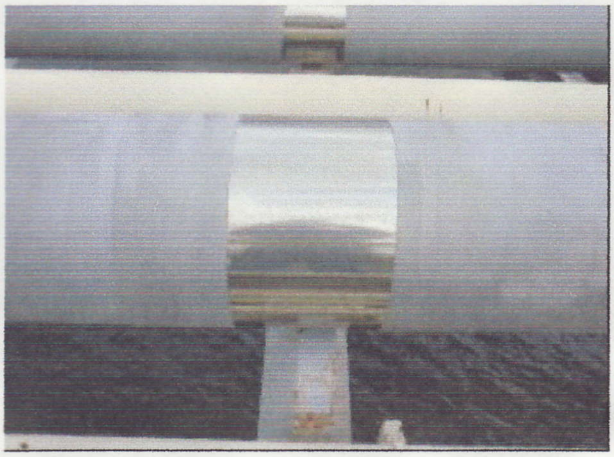
PICTURES FOR ACT TAPE 100SYSTEM, SG SYSTEM: 9 YEARS LATER ON BERTH IN REFINERY PLANT IN JAPAN

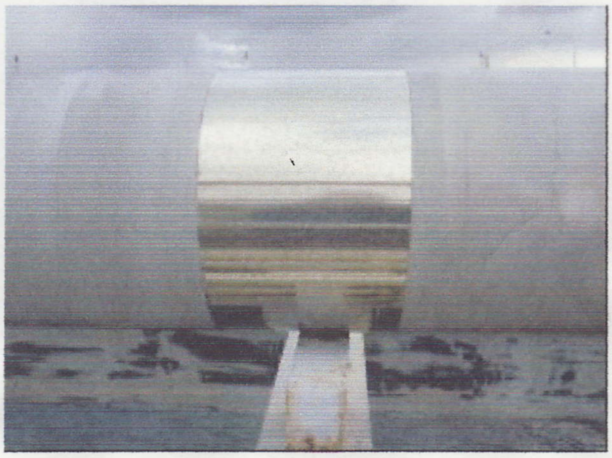
ACT 100 SYSTEM

[INSTALLED : JULY, 1995] **[PICTURE : 14 JAN., 2004]**

ACT SG SYSTEM







ACT-T002-

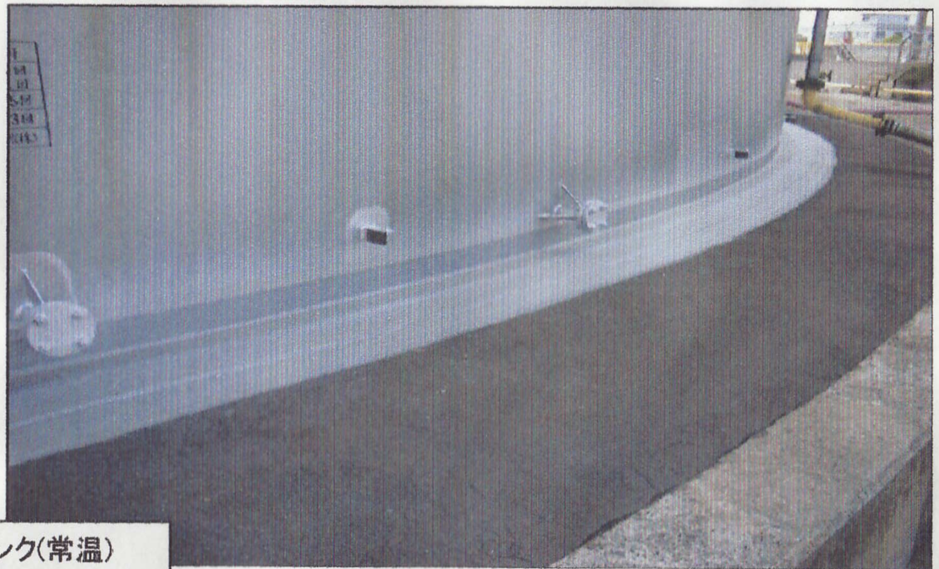
PICTURES FOR ACT TAPE W, WH

AT TANKS IN REFINERY PLANT IN JAPAN

ACT TAPE W SYSTEM
(INSTALLED:1999)

(PICTURE: 20 AUG., 2006)

#205タンク(常温)



#207タンク(常温)

ACT TAPE WH SYSTEM

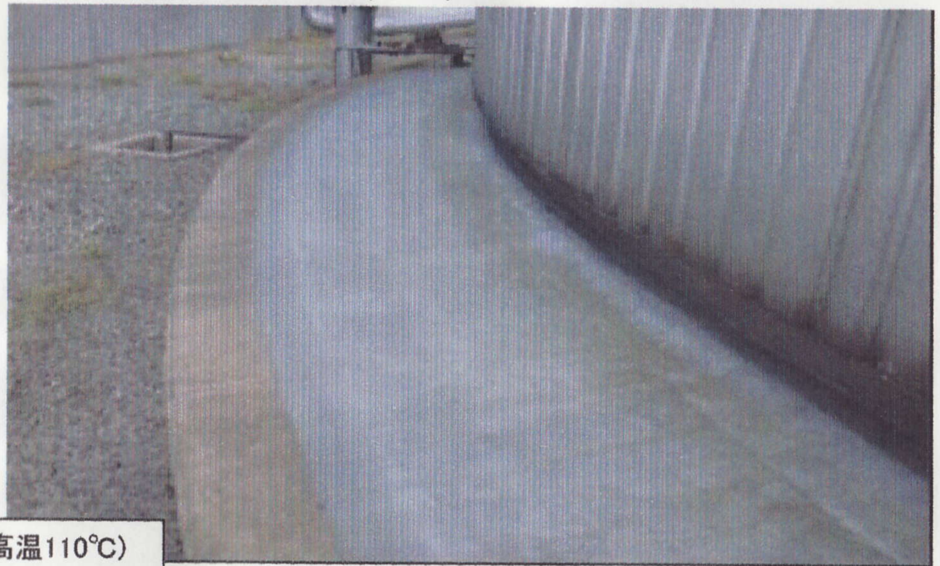
(INSTALLED: 1996)

(PICTURE: OCT., 2006)

#501タンク(高温110℃)

(INSTALLED: 1997)

(PICTURE: OCT., 2006)



#502タンク(高温110℃)