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1.

Necessity of GPI Standard

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Abstract: Because acid resistance of metal tube is weak, it is required to develop new oil country tubular goods, including FRP pipe and related products. This paper explain the needs of GPI standard also to apply to newly developed usage, such as EOR(Enhanced oil recovery) , acid-resistant pipes, and pipes for deep well.

Keywords: GPI, API, ISO, standard, FRP, OCTG, acid resistance

2.

Development of T&C Type Semi-Flush Coupling with RTC8/inch for Oil & Gas Well

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Abstract: In order to increase the resource drilling efficiency by the drilling hole diameter of applying mining tube in the minimum and the maximum inner diameter of the mining tract, such as oil and gas is to coupling diameter minimum , has the durability to light and I will report on the successful outcome to the technological development of semi-flash coupling with the GPI standard tube achieve load reduction due to the weight at the time of deep.

Keywords: oil and gas mining pipe, corrosion-resistant high-pressure pipe, GPI standard, semi flash coupling, T & C Type, RTC8 / inch coupling

3.

Buckling strength and opening area of GPI standard screen pipe

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Abstract: The screen pipe with slit hole in the axial or circumferential direction or with large number of circular holes is used in oil drilling. Strength reduction against external pressure (axial buckling, circumferential crushing) to M grade pipe with axial slit hole was minimized, is optimum to be a standard for GPI standard screen pipe. In this paper, we report the performance characteristics of the buckling strength and the aperture ratio of GPI standard screen pipe.

Keywords: GPI standard, OCTG, screen pipe, buckling strength, surface aperture ratio of the pipe

4.

GPI Standard Dimensions

Kanako TAKENISHI, Masaki UHARA, Takio SHIMOSAKON, Kozo OKAZAKI, Kunio NAKAI,
Shinichi TAMURA, Yoshinori NISHINO
GPI Standard committee

Abstract: We would like to release the interim basic dimension of GPI standard for new use EOR or deep ground oil well pipe application where requires high temperature, high pressure and corrosion resistance. Applicable range of Tubing, Casing and Line pipes is from 2-3/8" to 30", maximum pressure is 100 MPa and temperature is 250 degree C, and acid resistance is pH2. Main materials of GPI pipe is constructed by reinforced plastics, and the standard will be applicable to pipe body, coupling, pin thread joint, reducer, elbow, and packing for steel couplings etc. Here we explain the basic dimension and names excluding basic packing etc.

Keywords: OCTG, FRP, resin, acid tolerance, pH

5.

Development of new mat binder and production machine for glass fiber

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Abstract: Conventional glass fiber mat binder was made by only wet methods. We have developed a dry mat production machine using our newest dry mat binder. This "dry" system enabled to reduce the amount of energy consumption to one-tenth and the amount of binder to one-fifth, compared to the conventional wet production method.

Keywords: glass fiber mat binder, dry mat binder, dry production method, self-assembly, cross point

6.

Optimal Heat Condition of CSM Lamination to Reinforced Fiber for GPI Standard

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Abstract: Optimal condition of reheating bonding of hot melt powder binder which formed integrated laminated mat cloth-like reinforced fiber used for OCTG and CSM (chopped strand mat) for outer surface reinforcement and preventing fiber pattern was decided by experiment written in this work, and glass fiber laminate adhesion work standard was determined. Data written in this work will clarify the relationship between adhesion force of mat binder adhered on CSM and heating temperature and time by ironing. This work will provide the optimal condition of the heating temperature and time of mat binder adhered on CSM at the production line.

Keywords: CSM, mat binder, OCTG, adhesion, heating

7.

Improvement of the durability of shale gas mining tube

~ Thermal expansion measures of material to the temperature difference ~

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Abstract: The material that thermal stress generated due to the temperature difference between the mining tube, has large allowable amount of deformation of the material for the thermal expansion is large, *i.e.*, is a material compatible with the mining tube. FRP pipe was found to have the maximum permissible power for thermal expansion. On the other hand, other metal material elongation at break (allowable deformation amount) is small. Thus, for the heat stress generated by the temperature difference between the shale gas drilling pipe, GFRP pipe is considered to have very good properties as compared to corrosion steel pipe.

Keywords: shale gas, mining tube, durability, temperature difference, thermal stress

8.

GPI standard method for simple corrosion degradation test method for FRP OCTG

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Abstract: In the case of the steel pipe used as OCTG, the acid tolerance limit is about pH3.3. On the other hand, FRP material made from glass fiber and resins exhibit pH2 class of acid tolerance, expected to use in deep wells, shale gas, etc. This paper showed the simple evaluation method of corrosion resistance for FRP resin using a household electric kettle and evaluated the acid tolerance in pH2 level of FRP resin.

Keywords: OCTG, FRP, resin, acid tolerance, pH

9.

Acid-tolerance evaluation of resin for high temperature and high pressure for EOR (Based on GPI standard method)

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Abstract: To increase the recovery amount of crude oil, in addition to the current methods of oil extraction and natural oil extraction, water injection, and thickener implantation or the like, deep well mining of several thousand meters class and EOR(Enhanced Oil Recovery) is indispensable. FRP tube having acid tolerance less than pH2 and 250°C class of heat-resistant is expected. In this paper, we applied the easier and more effective evaluation method of the acid tolerance of the resin based on GPI standard method written in the previous paper.

Keywords: OCTG, EOR, FRP, resin, acid tolerance, pH, heat-resistance

10.

GPI standard anti-corrosive FRP high pressure pipes by Centrifugal Winding

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Abstract: Erosion-corrosion problems are still remained in oil and gas pipes even with 15Cr stainless steel pipes, therefore research and development of anti- acidic and corrosive FRP pipes against hydrogen sulfide and carbon dioxide are awaited. For solving these problems and meeting the market needs, GPI (Global oil and gas Pipes Institute) Standardization Committee has set the new technology standard as "Joint design standard of anti-corroding FRP high pressure pipes". The contents of this article is applicable to the API 8 round threaded joint of Tubing, Casing, Line pipes which withstands 100MPa internal pressure.

Keywords: oil & gas well pipes, high pressure FRP pipes, anti-acidic, anti-corrosive, threaded joint, 100MPa pressure

11.

Design Method of FRP Pipe of GPI Standard

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Abstract: Recently, the spread of new technology development, such as centrifugal winding(CW)method and GPI(Global Oil & Gas Pipe Institute)screw joint advances, application performance and research results of the FRP pipe over the long term has been accumulated. This paper described that the strength design method of new oil well pipes, required to untapped deep oil wells derived from depletion of the existing oil and gas fields, depletion oil field of play EOR mining, more than 30 year of durability of new specifications, such as the withstanding pressure 100MPa, depth 7000m, heat-resistant 250 °C, pH2 level of corrosion resistant, was clarified.

Keywords: OCTG, EOR, oilfield, FRP pipe design method, joint coupling, corrosion resistance.

12.

Centrifugal winding method of high pressure FRP pipes design method of oil-well pipes

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Abstract: Previously design of high pressure FRP pipes is based on evaluation of stress for burst of reinforced layer. Its technological standard was presented by API (American Petroleum Institute), and respective evaluation standard is shown by ASTM, AWWA, and ASME. However, besides being applicable only for under 25MPa inner pressure pipes, these does not reflect practical situation that high pressure FRP pipes is destructed mainly not by burst but weeping. This paper shows a design method of extending 25-100 MPa high pressure FRP pipes produced by CW (Centrifugal Winding) method, which is developed by Nishino and his colleagues, by making strain as criteria concerning water leak destruction

Keywords: high pressure pipe, oil well, FRP pipe, anticorrosion layer, design of FRP pipe, destruction mechanism

13.

Toward the GPI standard: Evaluation method for oil and gas well FRP high pressure pipes

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Abstract: We report on test result of strength of our FRP pipes made with centrifugal force winding process. The pipes are non-upset and meet the requirement of tentative GPI (Global oil and gas Pipe Institute) standard which covers more than 25 MPa inner pressure range of API standard. 3-1/2" M grade (general standard grade) pipes are used for the test because it can be applied for injection and pumping of water in the oil wells. The test items of pipes are inner, external pressure, and tensile strength. The items of joint screw are shearing stress, inner pressure, and tensile strength. The proper screwing torque and sealing chemical are also tested. NBL standard are applied in the test, which has its base on ASTM (American Society for Testing and Materials) standard and becomes base of GPI standard.

Keywords: FRP pipe, High pressure pipe, CW, Hydraulic test, GPI

14.

Screw joint parts for high pressure-durable FRP pipes

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Abstract: We have succeeded to develop parts of screw joint for API standard FRP pipes which include centrifugal winding (CW) type and filament winding (FW) type. It is a remarkable feature that the developed screw joint parts are pressure-durable and cost-effective, and it can be applicable to almost all FRP pipes. Even if we hit the screw with a hammer, its thread does not be broken different from steel one. Originally it is developed for CW pipes which have breaking inner pressure of almost 100 MPa and working inner pressure of 50 MPa. There are various sealing materials for the screw. Most tight one is to fix by resin, and it will have almost the same durability of the CW pipe as it is. However, it becomes impossible to loosen. If we use urethane, the breaking pressure will be 50MPa, and it is half cured with the fastening torque of 20 kg/m and loosening of 200 kg/m. Other selection will be silicone sealant of 40 MPa and seal tape of 25 MPa.

Keywords: API standard, Centrifugal Winding (CW), Screw joint, Breaking pressure, Notch crack, Weeping, Structural wall, Protect layer

15.

Products strength comparison between Filament Winding (FW) and Centrifugal Winding (CW) high pressure pipes for oil well

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Abstract: There are two types in manufacturing method of API screw FRP high pressure pipe; Filament Winding (FW) method which is winding glass fiber roving and resin with tension and making lamination on outside of pipe mold, and Centrifugal Winding (CW) method which is laminating glass fiber and penetrating resin inside of mold with centrifugal force. In this study, from the comparison of theoretical feature and design performance about the most important factor of high pressure pipe quality, strength against inner pressure, between FW pipe and CW pipe, we have found the result that Filament Winding method cannot use its strength of laminated materials and also its effective strength of material is inversely proportional to the thickness of the laminated wall, since the inner lamination of reinforcing fiber is relatively compressed (loosing tension) by the tension of surface lamination, and that makes unequal stress on it under inner load condition. On the other hand, pipes made with Centrifugal Winding method has equally laminated wall since centrifugal force makes lamination with even tension. One example of design performance comparison between FW and CW with both 3-1/2" oil well tubing under the condition of the same wall thickness is inner breaking pressure, FW has 45MPa and CW has about 85MPa. Therefore, Filament Winding manufacturing method is not suite for FRP high pressure pipe manufacturing. Presently, API standard for such high pressure FRP pipes is extended to GPI Standard.

Keywords: Oil well pipe, FRP high pressure pipe, API standard FRP pipe, Filament Winding method, inner pressure strength, even tension, Centrifugal Winding method of FRP high pressure pipe

16.

The necessity for a rational entrepreneur evaluating to development of Manufacturing Enterprise

Kanako TAKENISHI, Takio SHIMOSAKON, Yoshinori NISHINO, Shinichi TAMURA,
Yutaka OTSUKA, Toshio NISHIDA

(Global Business Society, Business seeds Workshop Group)

Abstract: In this research we concluded that revival of the manufacture enterprise of Japan need social construction as commend achievement, having a function as evaluate their efforts and support them who contributed to the society. It is the nation and their culture thought that built the functional social construction. It is required directing of functional social construction for development of manufacturing entrepreneur. And furthermore, it needs to be interest of a consumer and a nation, and it should built a social construction as is rewarded an entrepreneur and an investor. At least it needs to prevent preferential benefit of non-manufacturing enterprises.

Keywords: prosperity manufacturing enterprise, enduring prosperity, functional society which requires reform, company's value evaluation, intellectual property rights evaluation, entrepreneur development

17.

N3-5 asset value evaluation method of Intellectual property right (Part 1)
- Substantiate the method of evaluating function of
Intellectual property right comply with Japan-

Kanako TAKENISHI, Takio SHIMOSAKON, Yoshinori NISHINO, Shinichi TAMURA, Yutaka OTSUKA,
Toshio NISHIDA

Global Business Society, Business seeds Workshop Group

Abstract In this research focus on financial statements that a publicly-traded company report in an order according to a certain standard to the Stock Exchange, a business index of other standards and company profits, and the basic information as sales report that is available. This report describes the empirical studies on comparing evaluation for produce the stock value ratio which cognate with company value based on the stock market. It compares with public company and the method of asset valuation in new business and Intellectual Property Right.

Keywords: company value, business plan valuation, assessment of Intellectual property, asset evaluation of new technology, DCF, stock value, company valuation, empirical research of method for N5-3 assessing

18.

N3-5 asset value evaluation method of Intellectual property right (Part 2)
- Substantiate the method of evaluating function of
Intellectual property right comply with Japan-

Kanako TAKENISHI, Takio SHIMOSAKON, Yoshinori NISHINO, Shinichi TAMURA, Yutaka OTSUKA, Toshio
NISHIDA

Global Business Society, Business seeds Workshop Group

Abstract: In this research focus on financial statements that a publicly-traded company report in an order according to a certain standard to the Stock Exchange, a business index of other standards and company profits, and the basic information as sales report that is available. This report describes the empirical studies on comparing evaluation for produce the stock value ratio which cognate with company value based on the stock market. It compares with public company and the method of asset valuation in new business and Intellectual Property Right.

Keywords: company's value, business plan valuation, assessment of Intellectual property, asset evaluation of new technology, DCF, stock value, company valuation, empirical research of method for N3-5 assessing,

Study on FRP oil well pipe traceability system by IC chip label (part 1)

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Abstract: The purpose for establishing GPI standard is to contribute to popularizing it by providing acid tolerable (less than pH2) and high temperature & high pressure (maximum 250 degree C and 100 MPa) pipes for using under extreme environment, for example, EOR and deep well, and its related products with fair price, establishing technology, quality and testing standards for mass production, and transacting technology certification business. GPI certified products will be used under extreme environment condition, and required strict safeness and socially high reliability for a use of a flammable dangerous materials or a toxic materials. Therefore, we have conducted the research and development on traceability which requires authentication of the applicable standard of individual product, and confirmation of product durability performance by managing cumulative elapsed use load on products. Finally, we successfully developed GPI traceability system which enables standard QC of GPI products and also management of durability in the acceptable range of products, by using IC chip label withstands under the high temperature and high pressure condition of deep underground where the FRP oil well pipes are used, and through the internet communication with the electronic information using smart phone.

Keywords: GPI, API, Oil well pipe, Corrosion resistant high pressure pipe, Tubing, Casing, Line pipes, Traceability, IC chip label, FRP internally laminated IC chip label, Traceability through the internet