



RADCO

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INDEX

COMPANY PROFILE

KEY PERSONNEL RESUME

FACILITIES

CATALOUGE

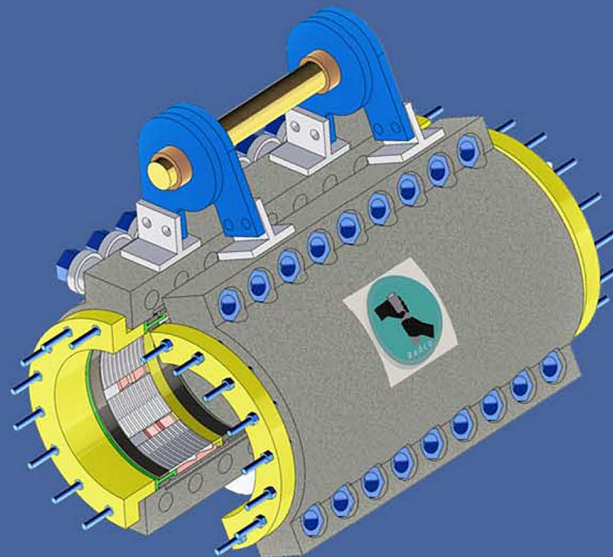
GL CERTIFICATE



RADCO

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TECHNICAL PROPOSAL



Emergency Pipeline Repair Systems (EPRS)

Pipe Clamp, Elbow Clamp, Tee Clamp, Smart Flange, Pipe Connector

Type: Structural & Sealing

Client: Iranian Offshore Oil Company (IOOC)



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1.0 INTRODUCTION

1.1 COMPANY INTRODUCTION

RADCO Commercial, Engineering and Consultant Startup Company is an entrepreneurial venture which aims to provide state of the art engineering products for the smart repair of onshore and offshore pipelines and structures. The company launched in 2018 to offer Reliable, Available, Durable, Cost-effective and Original (RADCO) products to reduce cost and time of pipeline repair. Furthermore, the supervision services to oversee the successful deployment and installation of the products will be provided, upon request. With total control of the manufacturing process, RADCO is able to design and develop EPRS products specifically tailored to individual client projects. Starting from the client's requirements, RADCO offers products which justify the following benefits:

- Elimination of the need for costly pipeline shutdowns.
- Saving the installation dead time.
- Repairing when the integrity has been compromised.
- Offering very competitive prices compared to similar products.
- Presenting innovative products as per client's necessity.

A range of pipeline repair products are supplied including:

- Leak repair products.
- Sealing and structural clamp
- Tie in products.
- Pipe to pipe Connectors.
- Pipeline connection products and smart tee.

1.2 SCOPE OF THIS DOCUMENT

This Technical Specification defines the minimum requirements of the Emergency Pipeline Repair Systems (EPRS). The technical specification stated in this document is subject to change according to client comments.

1.3 DEFINITIONS

Company	The client
TPA	Third Party Agency



Work(s)	All activities related to design, manufacturing and test of EPRS products
RADCO	The company, responsible for performing the work(s)
Contract	The agreement to be concluded between Company and RADCO for the performance of the work

1.4 ABBREVIATIONS

The following definitions refer to abbreviations used throughout this document:

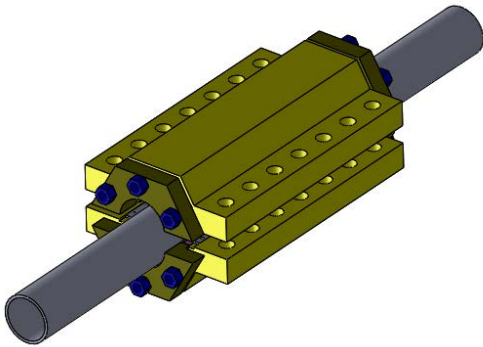
Parameters	Abbreviations
ASME	American Society of Mechanical Engineers
DNV	Det Norske Veritas
ECA	Engineering critical analysis
FAT	Factory Acceptance Test
FEA	Finite Element Analysis
FFS	Fitness For Service
ID	Inner Diameter
ITP	Inspection and Test Plan
MEG	Mono-Ethylene Glycol
MRB	Manufacturing Record Book
OD	Outer Diameter
SAW	Submerged Arc-Welded
SI	International System of Units
TBC	To Be Confirmed
TBD	To Be Determined



2.0 EPRS PRODUCT

2.1 SMART CLAMP

Smart Clamps are split mechanical fitting used to repair a damaged or leaking pipe, elbow and tee. The fittings are available in structural and non-structural version. The non-structural version may be used to repair a pipeline that has only minor damage such as pinhole leaks, local pipe wall thinning or shallow dents. The structural version, replaces structural integrity in more severely damaged pipelines with cracked girth welds, kinks, or punctures. It is equipped with retained energizing gripping mechanism on both ends of the clamp and compression elastomer sealing system in both circumferential and longitudinal orientations. Both structural and non-structural clamps can be equipped with dual seals arrangements for annulus hydrotest.

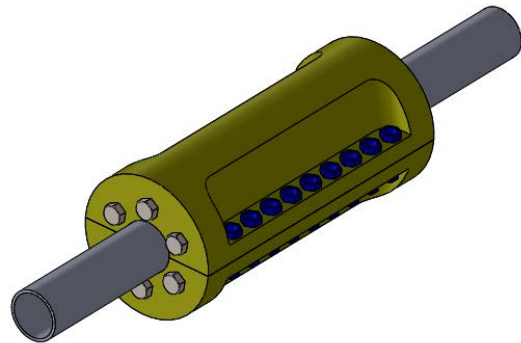


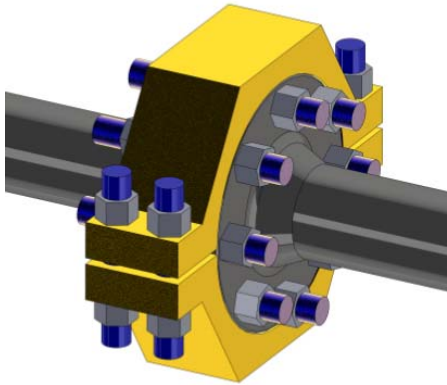
STRUCTURAL SMART CLAMP

- Leak Repair
- Crack like defects,
- Structural Integrity
- Tolerate high bending moment
- Tolerate high axial force

SEALING CLAMP

- Leak Repair
- Minor Defects
- Competitive price



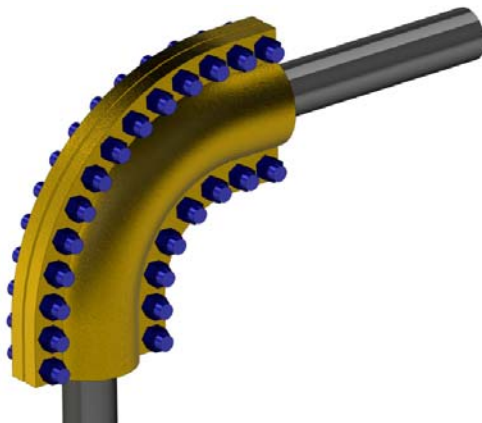
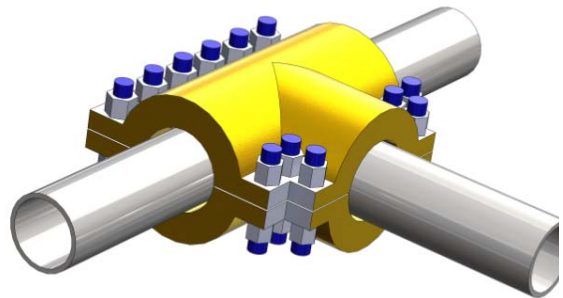


SEALING FLANGE CLAMP

Leak Repair of flange
Competitive price
Easy installation

SEALING TEE CLAMP

Leak Repair of Tee
Competitive price
Easy installation



SEALING ELBOW CLAMP

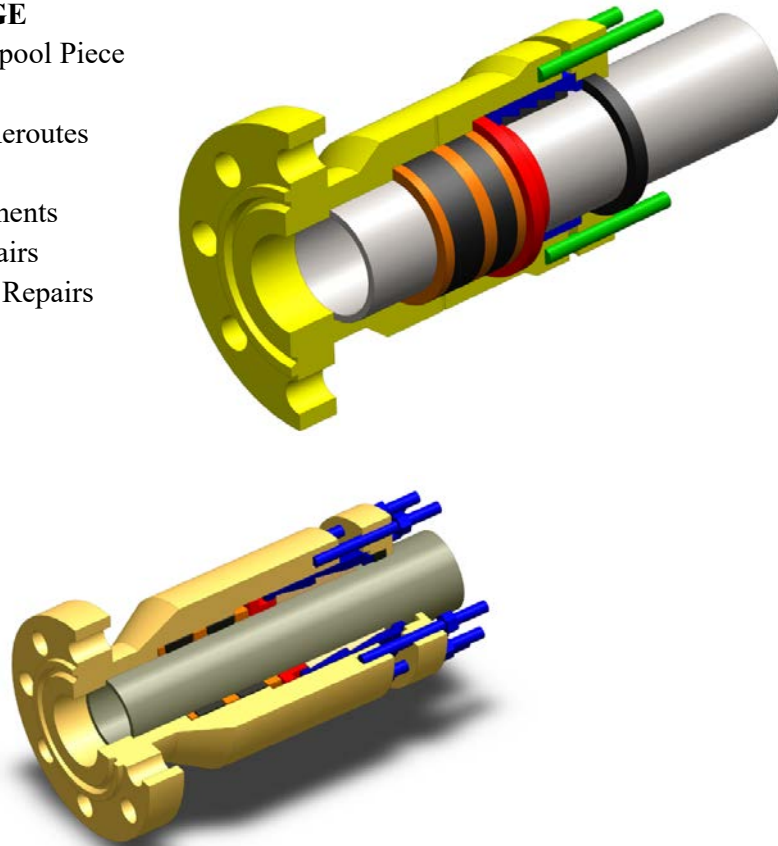
Leak Repair of Elbow and Bend
Competitive price
Easy installation

2.2 SMART FLANGE

The Smart Flange is a mechanical pipe end connector used for pipeline repairs, reroutes and abandonment projects. The Smart Flange utilizes collet grips that mechanically attach to a pipe and create a permanent, structural flanged end on the pipe. The Company uses standard, dual-barrier Viton seals to deliver long-term integrity and comes equipped with a test port to verify the annulus seal. Fast, reliable “single-set” design actuates grips and seals simultaneously.

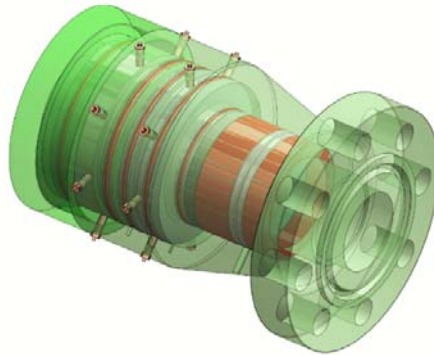
SMART FLANGE

Pipeline Spool Piece
Repairs
Pipeline Reroutes
Pipeline
Abandonments
Riser Repairs
Structural Repairs



2.3 HYDRAULIC SMART FLANGE

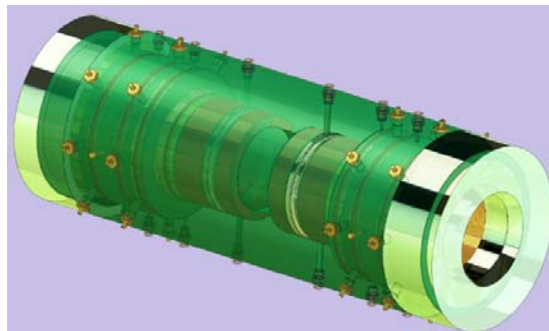
Hydraulic Smart Flange are hydraulically-set smart flange connectors in which sealing and gripping mechanisms are activated by hydraulic pressure. When actuated, HSF Connectors will structurally attach to and seal against the pipe. HSF Connectors can be designed in sizes and pressure ratings to meet any customer requirements.



2.4 PIPE TO PIPE CONNECTOR

Smart Hydraulic Pipe to Pipe Connectors are designed to provide structural connection against both pipe ends. These products eliminate the use of flange-flange or flange -smart flange connections for tie in and then significantly reduce repair dead time. In order to complete a pipeline repair, both pipeline ends are cut and beveled. Then the pipe to pipe connector is fully replaced on the pipeline at one side. The operator then reacts against the connector and move it until the half of the connector is stabbed over the bare pipe. Once stabbed, the operator starts setting the sealing and gripping mechanism on both pipe ends by hydraulic pressure. After installation, the annulus test will be performed on two test ports available on the products.

- Very fast installation
- Tie in application
- Used with mid spool
- Riser Repairs
- Structural Repairs



2.5 TECHNICAL SPECIFICATION

Customized designs are performed by RADCO engineering and R&D team in order to tailor the following technical specifications for the Emergency Pipeline Repair Systems (EPRS):

- Less installation dead time
- User friendly products to ease the installation
- Less dependency of the installation to the operator
- Dual seals for long term integrity
- Dual seals to enable annulus pressure verification test
- Optional grouting and filling ports



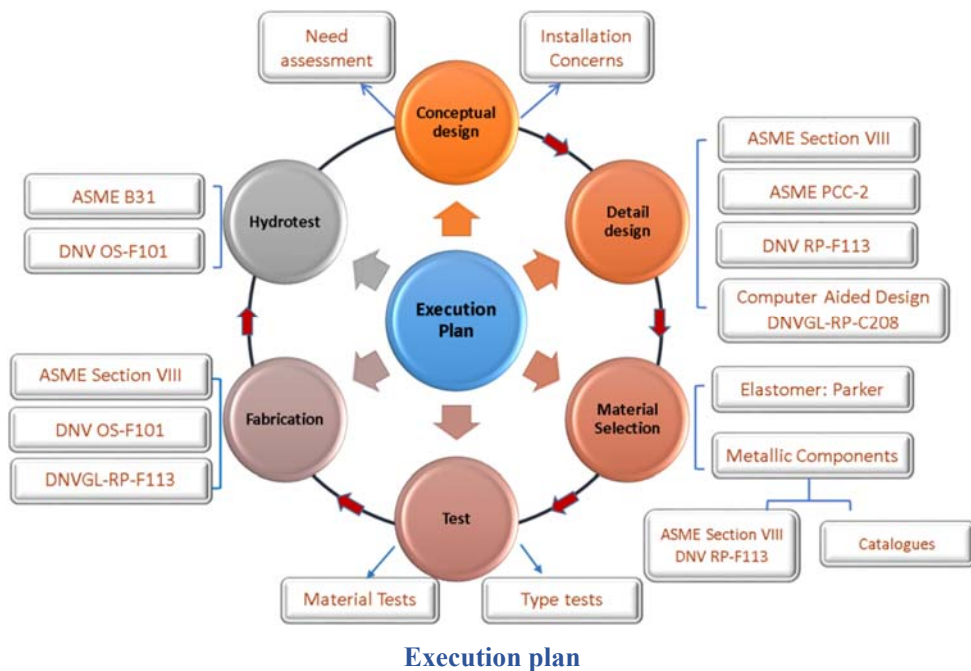
- Inboard seals & outboard grips for NACE compliance (for sour service)
- Anti-extrusion plates and rings to prevent seal extrusion under high internal pressure
- Longer gripper area to withstand full pipeline axial, bending, and torsional loads
- Mostly pre-assembled and less operational task on site
- Increased pipe ovality tolerance to shorten the installation time



3.0 PROJECT EXECUTION PLAN

3.1 EXECUTION PLAN

RADCO has launched to provide oilfield engineered services and products primarily to the oil and gas industry. RADCO is able to provide the entire package and can offer aftersales supports for the client, upon request. The personnel have extensive experience in the design, production, assembly and testing. Following contract award, a kick-off meeting is arranged at the soonest convenience to all to communicate all the technical aspects of the project. The EPRS Products are designed per RADCO designs and analysis, and test procedures. Technical interface meetings are suggested to ensure the designs provide the proper solution and installation is a success. The overall execution plan from the engineering, material selection, manufacturing and test throughout the project is shown in the below flowchart.



From the execution plan, it is inferred that all the necessary steps from detail design to FAT test are executed based on the verified standards and codes. This helps the EPRS products be tested and trusted in an approved way.

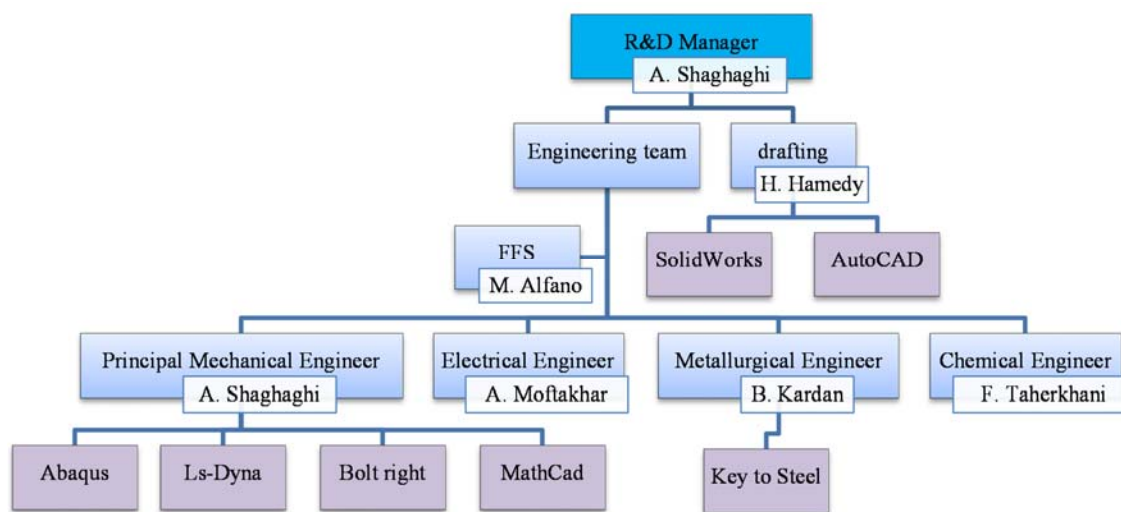
3.2 R&D KEY PERSONNEL

RADCO would engineer and perform qualification testing of the EPRS products in house to a client approved detailed inspection and test plan. To this purpose, comprehensive



research and development (R&D) has been considered for EPRS products. A Memorandum of Cooperation has been assigned with the University of Calabria in Italy for future collaboration of test facilities. The Memorandum of Cooperation is shown in Appendix C. The following table and chart show the R&D personnel and corresponding tasks performed throughout the project.

R&D Tasks	
Title	Tasks
Mechanical engineer	<ul style="list-style-type: none"> ➤ Conceptual design for typical EPRS products ➤ 3D modelling ➤ Drafting
Senior Principal mechanical engineer	<ul style="list-style-type: none"> ➤ Preforming design and analysis to support research and development ➤ Performing advanced FEA analysis ➤ Detail design and hand calculation
Senior fatigue and fracture engineer	<ul style="list-style-type: none"> ➤ Performing fitness for service analysis ➤ Performing failure analysis ➤ Performing ECA and FFS analysis
Senior Materials and metallurgical engineering	<ul style="list-style-type: none"> ➤ Material selection for metallic parts, in sweet and sour service ➤ Material selection for sealing and anti-extrusion plate and rings for high pressure application in sweet and sour services
Electrical engineering	<ul style="list-style-type: none"> ➤ For future development of Smart pigs and ...



R&D organization chart

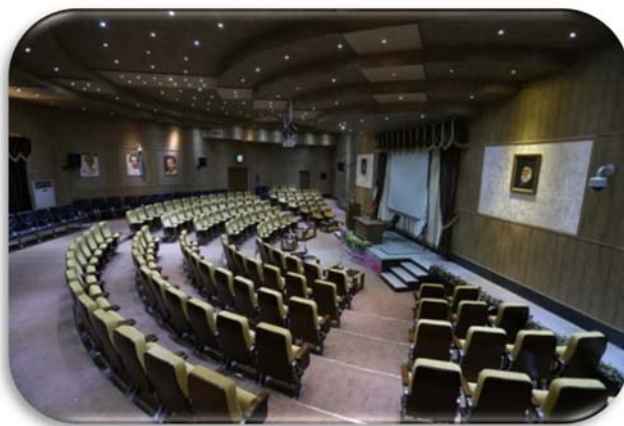
3.3 WORK LOCATION

The design, R&D, build and FAT will be conducted in house at our facility. Our facility includes:

Engineering Office located in: Qazvin Science & Technology Park

Amirkabir Advanced Technologies Incubator

Project management, R&D, design and document issue are performed in the engineering office. A conference hall and a meeting room are available to arrange for meeting and training workshops.



Conference Hall



Meeting rooms

Manufacturing yard located in Takestan Industrial Town

Where the manufacturing, Quality control, dimensional check and etc. are performed.

Test workshop (it is under construction in Caspian Industrial Town)

For future development of high tech EPRS products, a test workshop is being constructed on Caspian Industrial Town. This workshop has been designed particularly for type tests, main tests and FAT tests. According to agreed ITP, this workshop will be equipped with the corresponding typical test utilities. Future high tech EPRS products will be undertaken in this workshop.¹



Manufacturing yard

¹ Before its completion, the before mentioned tasks are performed in the Manufacturing yard.



Basic tests

3.4 MANUFACTURING

All manufacturing is performed by our facility located in Takestan industrial town. We are an Original Equipment Manufacturer (OEM) which enables us to maintain our high quality standards and be very commercially competitive. For special circumstances, machining would be outsourced to other manufacturers. Machining is performed by high precise facilities to ensure high tolerances and quality components are produced. All manufactured components are subjected to 100% inspection and this process is recorded on individual inspection forms. Some facilities are listed as:

- Heavy duty floor type NC boring
- Heavy duty milling
- Heavy duty lathe machining
- Heavy duty carousel machining
- Casting utilities
- Heavy duty plate rolling machine



Some facilities available in the workshop



Some facilities available in the workshop

3.5 PROJECT MEETING

Throughout the development of the project, RADCO will host meetings in the main office as:

- Kick off meeting
- Technical interface meeting
- Extraordinary meeting (as needed and arranged in advance)

3.6 THROUGH-PROJECT DOCUMENTATION

Upon agreement, the following list outlines typical project specific documents that are generated, reviewed and approved during the course of the project:

- Inspection & Test Plan (ITP)



- Factory Acceptance Test (FAT) procedure
- Master Document Register (MDR)

3.7 DOCUMENTATION

Documentation will be supplied in accordance with project document requirements. A Manufacturing Record Book (MRB) provides the required documentation as:

- Fully signed Inspection and Test Plan (ITP)
- As built general assembly drawings
- FAT Test Report
- Dimensional reports
- Installation procedure
- Release certificate
- Certificate of Conformity

3.8 COMMITMENT

RADCO is committed to:

- Understanding and anticipating customer requirements and expectation.
- Providing value added services and products using effective and efficient processes.
- Delivering services and products on time.
- Measuring results to quantify successes and identify opportunities for improvement.
- Identifying and eliminating waste in all aspects of executing our work.



4.0 DESIGN PHILOSOPHY

The design is based on our extensive experience in pipeline repair. All engineering works would be performed by RADCO qualified team. The products would be supplied with elastomer seals, i.e. NBR, HNBR. Dual seals each end would be supplied to enable a pressure verification test to be performed to confirm that a successful installation has been achieved

4.1 DETAIL DESIGN

The design of the EPRS products will be in accordance with corresponding codes, standards and Recommended Practices for pipeline repair systems.

- ASME Boiler and Pressure Vessel Code, Section VIII, Division 1 and 2
- DNV RP-F113; pipeline subsea repair
- DNV-OS-F101; Submarine Pipeline Systems
- ASME PCC-2; Repair of Pressure Equipment and Piping
- DNVGL-RP-F113; Pipeline subsea repair - Rules and standards
- DNV RP -F104; Mechanical Pipeline Couplings

General Design Requirements are listed below:

- EPRS products will be designed to an operating pressure in accordance with project specification and ASME B16.5.
- EPRS products will be designed to be used on pipe that meets the tolerances listed in API 5L for welded pipe.
- EPRS products will be applicable for standard service such as crude oil, natural gas, hydrocarbons, sour service, water or chemical injection, etc.
- EPRS products shall incorporate sacrificial anodes to provide cathodic protection.
- Dual seals each end would be supplied to enable a pressure verification test to be performed to confirm that a successful installation has been achieved.
- Longer gripper area is considered to tolerate bending moment and axial force.

4.2 MATERIAL DETAILS

The material selection has been considered based on verified standards and recommended practices as²:

² Upon request or upon unavailability, the similar materials can be chosen.

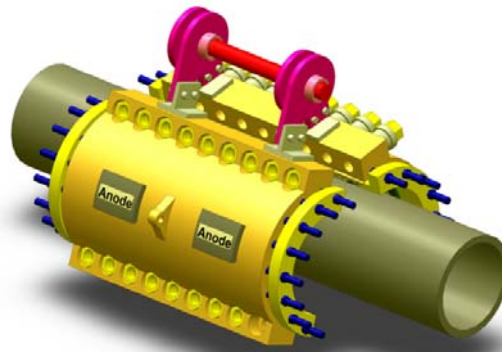


Material selection		
Items	Standard	Typical material
Metallic Materials	ASME Section VIII DNVGL-ST-F101 DNV-OS-F101	ASTM A105 AISI 4140 AISI 4340
Seal Materials	Parker Hannifin Seals, O-Rings, Polymer DNVGL-RP-F113	NBR HNBR Viton PU
Back up rings and plates	Parker Hannifin Seals, O-Rings, Polymer	PTFE
Bolt and Nuts	DNV-OS-F101	ASTM A193 ASTM A320

4.3 CORROSION CONTROL

Two levels of protection will be incorporated to protect the system for the given design life of the product;

- **Coating:** Materials shall be coated in accordance with the corresponding specification, as needed.
- **Cathodic protection:** in case of necessity, anodes would be fitted to the products and designed in accordance with the corresponding specification.



Cathodic protection

4.4 ADVANCED COMPUTER AIDED DESIGN

The detail design includes an FEA analysis on the system, hand calculations and all detailed engineering drawings. FEA work which is an essential part of the design is run on Abaqus and Ls-Dyna. All detailed engineering drawings are generated using Solidworks

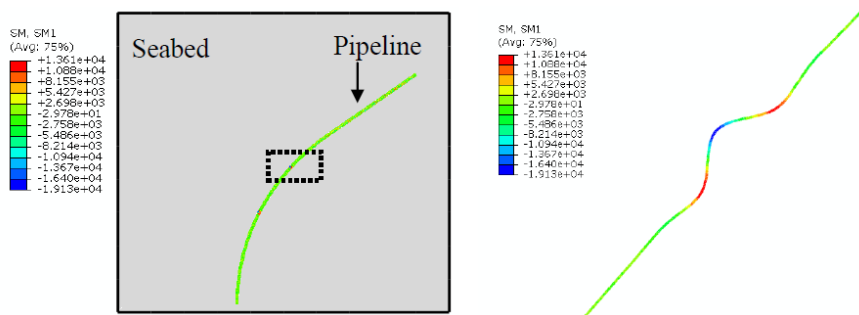


and AutoCAD. The following softwares are normally intended to be used for the performance of the WORK; the list is not exhaustive and may evolve during the course of the engineering.

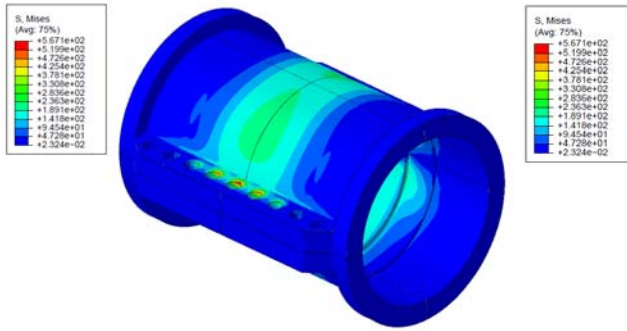
Softwares	
Title	Description
SolidWorks	3D modeling
Tolanalyst plugin	Tolerance analysis
Abaqus	Advance finite element analysis
Key to steels	Material selection
Mathcad	Standard based design
Ls-dyna	Sealing analysis
Bolt right	Bolt tightening calculation

4.5 FINITE ELEMENT MODELING

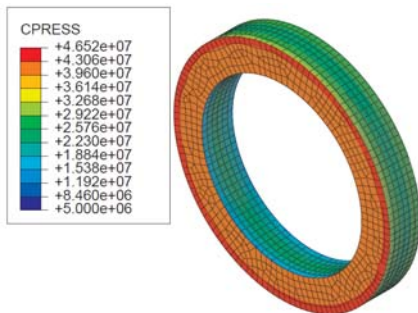
For EPRS product design, determination of the structural capacity is achieved by a non-linear finite element analysis methods based on DNVGL-RP-C208. This helps the company to design and manufacture the products as reliable as possible with lesser try and error efforts. The design would include a detailed FEA analysis of the product, hand calculations and all engineering drawings. FEA analysis are performed by Abaqus and Ls-Dyna with reference to pipeline data at the failure.



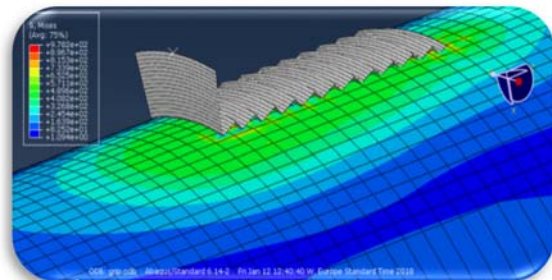
Bending moment distribution along the pipeline route in case of thermal buckling



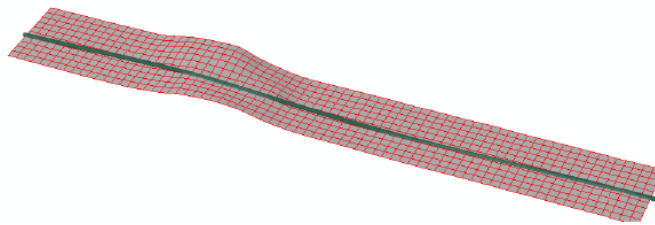
Typical FEA output on smart clamp body under pressure



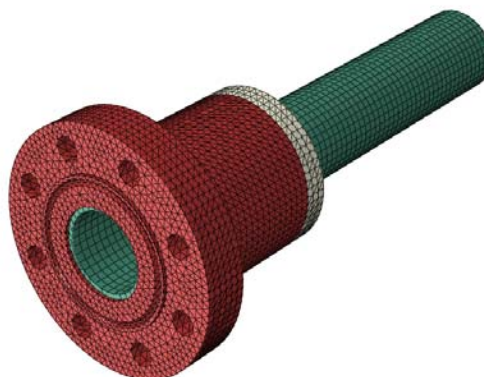
Typical FEA output on seal rings



Typical FEA output on gripping



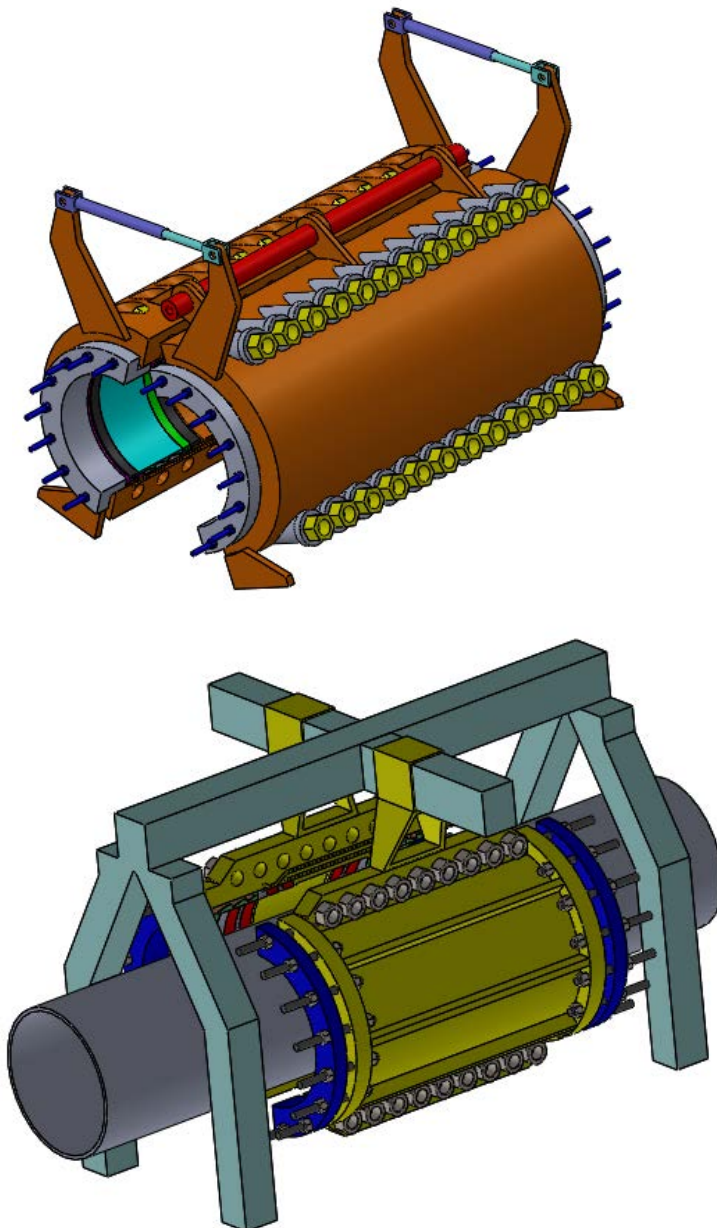
Typical FEA mesh for pipeline laid on 3D seabed



Typical FEA mesh on smart flange

4.6 PRODUCTS INSTALLATION

The product assembly for higher sizes, e.g. 32 inch, considering installation frame is shown below. The installation frame is subject to change according to client request. For smaller sizes also a frame can be designed to ease the installation and reduce dead time, upon client request.



Typical installation frames



5.0 TESTING AND INSPECTION

The EPRS products shall be subjected to a FAT test to demonstrate the intended and required functionality are met. The FAT procedures shall be written in accordance with DNV OS F101 and ASME B31 as applicable. The FAT procedure will be submitted for approval prior to commencing of any tests. Testing shall include:

- Proper assembly and interaction between internal components
- Activation
- Hydrostatic test
- Proper overall functionality

The hydrostatic shall be acceptable if:

- No visible leakage occurs during the specified pressure hold period of the test.
- Pressure shall be considered stabilized when rate of change of pressure is no more than 5% of test pressure per hour.
- Hold periods will start after stabilization has occurred.
- The test pressure shall not drop below the minimum test pressure.

All testing will be performed by competent persons at the main workshop in the presence of the client and third party. The test results and product certification will be presented as part of MRB document, which is expanded upon in the documentation section.



6.0 SUPPORT

6.1 ENGINEERING SUPPORT

Upon request, the following engineering activities can be supported by RADCO:

- Failure analysis of defects in the pipeline to find root causes.
- Comprehensive FE analysis of the as built condition of pipeline.
- ECA and FFS analysis.
- On site engineering support for any unpredicted issue during installation.

6.2 SPARES

The identification and extent of spares supplied with the project deliverables can be agreed prior to the project award. A typical set of spare will be listed in the summary.

- Seal components
- Stud bolts and nuts

6.3 AFTERSALES SUPPORT AND MAINTENANCE

The team can provide office based and out-of-hours technical support for all delivered systems with access to a database of both technical data and construction information. On-site commissioning, servicing and repairs can also be carried out for working both on and offshore, upon request.

6.4 CLIENT INSPECTION AND AUDITING

RADCO promotes an open door policy with clients free to visit and inspect both at our facility and key nominated sub-contractors. To ensure we have the appropriate deliverables available for such visits we request a 3-day minimum notice period.



7.0 INDUSTRY STANDARD REFERENCES

The following standards and specifications will be used in the engineering and production of the proposed products:

- API SPEC 5L, Specification for Line Pipe
- API SPEC 6H, Specification on End Closures, Connectors and Swivels
- ASME B16.5, Pipe Flanges and Flanged Fittings
- ASME B31.4_piping transportation system for liquid hydrocarbons and other liquids
- ASME B31.8_ Gas transmission and distribution piping system
- ASME B31G, Manual for Determining the Remaining Strength of Corroded Pipelines
- ASME Boiler and Pressure Vessel Code, Section IX Welding and Brazing Qualifications
- ASME Boiler and Pressure Vessel Code, Section VIII, Division 1 and 2.
- ASME Boiler Pressure Vessel Code, Section V Nondestructive Examination
- ASME PCC-1, Guidelines for Pressure Boundary Bolted Flange Joint Assembly
- ASME PCC-2, Repair of Pressure Equipment and Piping
- ASME/ANSI B18.2.1, Square and Hex Bolts and Screws Inch Series
- DNV RP B401, Cathodic Protection Design
- DNV RP-F113 pipeline subsea repair
- DNVGL-RP-C208, Determination of structural capacity by non-linear finite element analysis methods
- DNVGL-RP-F113 Pipeline subsea repair - Rules and standards
- DNVGL-ST-F101, Submarine pipeline systems
- DNV-OS-F101, Submarine Pipeline Systems
- MSS SP-44, Steel Pipeline Flanges
- NACE MR0175, Part1 & Part2 (resist sulfide stress cracking)



APPENDIX A: RADCO EPRS PRODUCTS APPLICATION SHEET



RADCO EPRS PRODUCTS APPLICATION SHEET									
COMPANY NAME :				CONTACT PHONE :					
CONTACT NAME :				CONTACT EMAIL :					
PIPE APPLICATION DETAILS				FLANGE BOUNDARY CONDITIONS					
PIPE NOMINAL SIZE (OD)				INSTALLATION ANGLE		N/A	DEG		
PIPE CLASS/RATING				FLANGE OD RADIAL CLEARANCE		N/A	MM		
PIPE DESIGN CODE				NEAREST OBSTRUCTION FROM FLANGE ASSEMBLY		N/A	MM		
PIPE MATERIAL				<i>ADDITIONAL RELEVANT INFORMATION HERE:</i>					
PIPE CONSTRUCTION TYPE									
PIPE YEAR OF MANUFACTURE									
PIPE SCH./WALL THICKNESS									
PIPE CORROSION ALLOWANCE								MM	
PIPE OVALITY								MM	
OPERATING PRESSURE								BARG	
DESIGN PRESSURE								BARG	
TEST PRESSURE								BARG	
TEMPERATURE RANGE (MIN/MAX)								° C	
LINE MEDIA									
WATER DEPTH (MSL)				M		SEALANT INJECTION			
				YES		NO			
RADCO EPRS PRODUCTS SPECIFICATION REQUIREMENTS									
DESIGN CODE									
TPI WITNESSING REQUIRED									
RADCO PRODUCT TYPE & CONFIGURATION									
TOPSIDE / ONSHORE	<input type="checkbox"/>	SUBSEA - DIVER INSTALLED	<input type="checkbox"/>	SEAL CLAMP	<input type="checkbox"/>	QUANTITY REQUIRED			
SMART CONNECTOR	<input type="checkbox"/>	SMART FLANGE	<input type="checkbox"/>	STRUCTURAL CLAMP	<input type="checkbox"/>	PRESSURE CONTAINING AND STRUCTURAL	<input type="checkbox"/>		



APPENDIX B: TYPICAL MASTER DOCUMENT REGISTER



Typical Master Document Register (MDR)				
Item	Description	Document No.	Rev.	Status
1	Inspection and test plan			
2	FAT test procedure			
3	Products general assembly drawings			
4	Field Annulus seal test procedure			
5	Technical specification			
6	Annulus test procedure			
7	Field installation procedure			

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Ali Shaghaghi Moghaddam

Assistant Professor Mechanical Engineering Department, Azad University of Technology
CEO MahRad Sanat Khallagh (RADCO) company

Personal Identification

Place and Date of Birth : Takestan, June 1983
Nationality : Iranian
Marital Status : Married

Education

November 2017

- Visiting Professor, University of Calabria

2006-2010 Khaje Nasir University of Technology, Tehran, Iran

- PhD. in Mechanical Engineering

2009-2010 University of Calabria, Italy

- Visiting student

2004-2006 Sharif University of Technology, Tehran, Iran

- Master degree In Mechanical Engineering

2000-2004 Khaje Nasir University of Technology, Tehran,

- Bachelor degree In Mechanical Engineering

Jobs

2010-2018: Iranian Offshore Engineering and construction Company

- Pipeline engineer
- Pipeline engineering coordinator

2011- present Azad University of Technology, Takestan branch

- Assistant Professor, Mechanical Engineering Department

2004-2008: Beton Machine company

- Engineering Designer

Academic experience

Research interest:

- Fracture Mechanics
- Pipeline integrity management
- Failure analysis of offshore assets
- Engineering Critical Assessment (ECA)
- Fitness for Purpose (FFP)
- Design and fabrication of smart flange and smart clamp
- Finite element analysis and user subroutines in Abaqus
- Finite element analysis of elastomers
- Functionally graded material

Teaching:

- Machine Design
- Advanced Machine Design
- Advanced Computer Aided Design
- Engineering by Design
- Engineering Mechanics: Statics
- Mechanisms design
- Fracture mechanics ,Fatigue and creep
- Theory of Elasticity & Plasticity
- Continuum mechanics
- Finite element analysis

Selected Publications:

- Rahmatollah Ghajar, Ali Shaghaghi Moghaddam and Marco Alfano." An improved numerical method for computation of stress intensity factors along 3D curved non-planar cracks in FGMs". International Journal of Solids and Structures, Volume 48, Issue 1, 1 January 2011, Pages 208-216
- Ali Shaghaghi Moghaddam, Rahmatollah Ghajar and Marco Alfano." Finite element evaluation of stress intensity factors in curved non-planar cracks in FGMs". Mechanics Research Communications, Volume 38, Issue 1, January 2011, Pages 17-23
- Rahmatollah Ghajar and Ali Shaghaghi Moghaddam." Numerical investigation of the mode III stress intensity factors in FGMs considering the effect of graded Poisson's ratio". Engineering Fracture Mechanics, Volume 78, Issue 7, May 2011, Pages 1478-1486.
- Ali Shaghaghi Moghaddam, Marco Alfano, Rahmatollah Ghajar." Determining the mixed mode stress intensity factors of surface cracks in functionally graded hollow cylinders". Materials and Design, Volume 43, 2013, Pages 475-484
- Ali Shaghaghi Moghaddam , Marco Alfano. "Finite element analysis of stress intensity factors in 3D cracks in FGMs under thermal loading", Engineering Fracture Mechanics, Volume 146, September 2015, Pages 172-184.

- Ali Shaghaghi Moghaddam, Arash Mohammadian, Mohammad Alijani , Samira Karami, “Fabrication of Nickel-Alumina graded materials by pressureless sintering”. Advanced composite materials. Accepted for publication
- Ali Shaghaghi Moghaddam and Saeid Mohammadnia,” Three dimensional finite element analysis of 4 inch smart flange on offshore pipeline”, Ocean Systems Engineering Volume 4, Number 4, December 2014, pages 279-291.
- Ali Shaghaghi Moghaddam, Saeid Mohammadnia and Mohammad Sagharichiha” Analysis of offshore pipeline laid on 3D seabed configuration by Abaqus”, Ocean Systems Engineering Volume 5, Number1, 2015, pages 31-40
- Ali Shaghaghi Moghaddam, Saeid Mohammadnia, Three dimensional finite element analysis of offshore pipeline with Abaqus, Fifth Iranian Pipe & Pipeline Conference, Dec 2013
- Seyed Mohammad Hossein Sharifi, Seyed Reza Soheili, Ali Shaghaghi Moghaddam , Farhood Azarsina, Engineering Critical Assessment for Offshore Pipeline with Semi Elliptical Surface Cracks in Girth Weld – Comparison of FEM and BS7910 Guideline, international journal of maritime technology, Vol.10/ Summer 2018 (37-44)
- Ali Shaghaghi Moghaddam , Marco Alfano, Thermoelastic analysis of surface cracks in FGMs hollow cylinders using the interaction energy integral method, Engineering Fracture Mechanics, Volume 202, 15 October 2018, Pages 103-115

Pipeline experience

Pipeline engineer for the following projects

- South Pars Gas Field Development (Phase 17& 18)
- South Pars Phases 20& 21 offshore and onshore pipeline project
- South Pars Phase 19 offshore and onshore pipeline project and Condensate Export Terminal (SPM)
- South Pars Phase 14 pipeline project
- South Pars Phase 12 pipeline project
- South Pars Phase 15&16 pipeline project
- South Pars Phase 22&24 pipeline project
- Iran-Oman offshore pipeline project

Pipeline Engineering coordinator

- South Pars Phase 12 engineering coordinator
- South Pars Phase 19 engineering coordinator

Pipeline engineering experience

- Scientific committee of “1st Iranian conference on Asset Integrity Management in Oil&Gas” <http://www.iranaim.com/>
- Good knowledge of key pipeline engineering principles
- Hands-on expertise of FE analysis software

- Experience of interfacing within other disciplines
- Designing and detailing in accordance with relevant Codes, Standards and Design Guides
- Reviewing of design documentation including detailed design reports, construction drawings, data sheets, material take-offs
- Being involved in several leak detection and leak repair projects
- Frequent site experience for offshore works such as:
 - Free span rectification
 - Pre-lay and post lay survey
 - Pre-commissioning and pigging
 - Pipe laying
 - Goose neck and dogleg spools installation
 - SPM installation
 - ROV and geophysics survey
 - Leak detection
 - Leak repair by installation of smart flange and smart clamps
- Pipeline Thermal Expansion Analysis
- Pipelines - On Bottom Stability Analysis
- Lateral Buckling Analysis
- Tie in & Expansion Spool Design Report
- Pipelines Wall Thickness calculation
- Allowable Span Length and Bottom Roughness Analysis Report
- Engineering critical assessment and associated fracture and fatigue assessment

Codes and standards

- DNV RP-F110 Global Buckling of Submarine Pipelines
- DNV OS-F101 Offshore Standard for Submarine Pipeline Systems
- DNV RP F105 Free Spanning Pipelines
- DNV-RP-F204 Riser fatigue
- DNV-OSS-302 Offshore Riser Systems
- DNV-RP-F109 On-Bottom stability design of submarine pipeline
- BS7910 Guide to methods for assessing the acceptability of flaws in metallic structures
- API 579 Fitness-For-Service
- DNV-RP-F116
- Integrity Management of Submarine Pipeline Systems

- DNVGL-RP-0002 Integrity management of subsea production systems
- DNV-RP-F206 Riser integrity management
- ASME B31G Manual for Determining the Remaining Strength of Corroded Pipelines
- ASME PCC-1 Guidelines for Pressure Boundary Bolted Flange Joint Assembly
- ASME PCC-2 Repair of Pressure Equipment and Piping

Computer Skills

- Experience with stress analysis using Autopipe
- Expert in MathCAD for detail engineering
- Excellent ability to use Solidworks, to create detailed models, drawings & assemblies
- Excellent experience in ABAQUS for stress analysis
 - 3D interaction of seabed and pipeline
 - Thermal expansion modeling
 - Buckling analysis
 - Analyzing cracked structures
 - 3D stress analysis
- User subroutines in Abaqus
- Handling LS-DYNA ; Finite Element Analysis Software
- Handling AutoCAD; Drafting software
- Handling Adams; The Multibody Dynamics Simulation Solution
- Experience in Fledermaus:
 - To analyze seabed topography
 - To route design and modification
 - To export data to ABAQUS for further stress analyzing
- Programming in MATLAB, Mathcad, and FORTRAN.
- Extra: Corel Draw, Tecplot, Origin, Latex

Design skills

- Design and fabrication of Smart Flange (4inch) (National patent)
- Design and fabrication of Smart Hydraulic pipe to pipe connector (4inch)
- Detail design of 32 inch Smart clamp(National patent)
- Detail design of Hydraulic Smart Flange(National patent)
- Conceptual design of boltless Smart clamps(National patent)
- Design and fabrication of bending plant (National patent)
- Design and fabrication of torsioning plant (National patent)
- Design and fabrication of different models of truck mixers
- Design and fabrication of hydraulic power tiller (National patent)
- Design and fabrication of hot press sintering
- Design and fabrication of mini tank (National patent)
- Familiar with different machine design standards
- Familiar with material selection
- Familiar with elastomer materials and corresponding FE analysis

Language skills

- Excellent in English
- Good in Italian

Personal skills

- Self-motivated
- Creative problem solving

- Good communicator with the ability to effectively manage and collaborate with peers and clients
- Working within time targets
- Ability to cope with challenging problems
- Very enthusiastic to learn more about my career
- Excellent ability to hold technical presentations
- Good ability to coordinate a team

Honors

- Ranked 1st in university entrance exam for PhD 2006
- Ranked 32 in university entrance exam for M.Sc. 2004
- Youngest PhD graduate at the university 2010
- Top university researcher at 2011,2012 and 2013

References

Marco Alfano, PhD | Assistant Professor
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Marco Alfano | Curriculum Vitae

Assistant Professor in Mechanical Engineering
Department of Mechanical, Energy and Management Engineering
P. Bucci, 44C, Rende (CS), University of Calabria

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Bio Sketch - Marco Alfano is an Assistant Professor at University of Calabria (UNICAL), Italy. He received his PhD degree in Materials and Structures from UNICAL. Prior to his appointment as an Assistant Professor, he also served as Research Fellow at KAUST (KSA), as Fulbright Scholar at University of Illinois (USA) and as Post-Doc Fellow at UNICAL. His recent research has been mainly carried out in the broad area of solid mechanics with both experimental and computational emphases.

Education

2006: Ph.D. in Materials and Structures, Department of Theoretical and Structural Mechanics, University of Calabria (UNICAL), Italy.

2002: MSc in Mechanical Engineering, Department of Mechanical Engineering, University of Calabria (UNICAL), Italy.

Fields of Interest

- Bio-inspired materials and architected interfaces
- Additive manufacturing
- Computational fracture mechanics
- Joining techniques
- Surface modification strategies

Professional Experience

- **National Institute for Nuclear Physics** **Rende**
Fellow, Italy *2017-present*
- **Department of Mechanical, Energy and Management Engineering** **University of Calabria**
Assistant Professor (with tenure), Italy* *2012-present*
- **Cohmas Laboratory** **King Abdullah University of Science and Technology**
Research Fellow, Saudi Arabia *2010-2011*
- **Department of Civil and Environmental Engineering** **University of Illinois at Urbana-Champaign**
Post-Doctoral Fellow, U.S.A. *2009*
- **Department of Mechanical Engineering** **University of Calabria**
Post-Doctoral Fellow (Government Fellowship), Italy *2007-2008*

(*) In the Italian system the Assistant Professor (*i.e.*, Ricercatore) is a tenured position subjected to positive evaluation after three years of service. Promotion to Associate or Full Professor requires a National Habilitation (ASN) from the Italian Ministry of Education, University and Research (MIUR). Final hiring depends on University-level funding availability.

Academic Awards and Scholarships

- Habilitation as Full Professor, Italian Ministry of Education and Research (ASN 2016).

- Elsevier Outstanding Reviewer Recognition, Materials and Design (2015), Elsevier, Amsterdam.
- Elsevier Reviewer Recognition, Materials Science and Engineering A (2016), Mechanics Research Communications (2016), International Journal of Solids and Structures (2015), Engineering Fracture Mechanics (2015), Elsevier, Amsterdam.
- Giovani Ricercatori Prize, project: Multiscale analysis of debonding in composite laminates, awarded from University of Calabria (2015).
- Habilitation as Associate Professor, Italian Ministry of Education and Research (ASN 2012).
- Best Poster Award, within the European Adhesion Conference (EURADH), Friedrichshafen, Germany (2012) (award sponsored by JOWAT AG, Germany).
- Loctite-Henkel Research Award, Workshop Advances in Joining Technologies, Alma Mater University of Bologna (2011).
- Recipient of a Fulbright Scholarship, University of Illinois at Urbana-Champaign (2009).

Visiting Positions

King Abdullah University of Science and Technology, KSA (Visiting Professor), 05-08/2017
King Abdullah University of Science and Technology, KSA (Visiting Professor), 05-06/2016
Ecole Polytechnique Federale de Lausanne, Switzerland (Visiting Professor), 07-09/2015
King Abdullah University of Science and Technology, KSA (Visiting Professor), 02-07/2014
University of Illinois at Urbana-Champaign, USA (Visiting Scholar), 08/2013
King Abdullah University of Science and Technology, KSA (Visiting Researcher), 02-07/2013
University of Illinois at Urbana-Champaign, USA (Visiting Scholar), 07-08/2011
ibidem (Visiting Scholar), 03/2008
ibidem (Visiting Scholar), 08-10/2006
University of Versailles, France (Visiting Scholar), 03-06/2006

Teaching

Marco Alfano is currently supervising 2 PhD, 1 MS student and 5 Undergraduate Students. He has a strong record of mentoring undergraduate students. He taught both undergraduate and graduate courses as described below.

- Spring 2014: Instructor, Computational Solid Mechanics, Mechanical Engineering Program, KAUST (graduate level).
- 2012 - present: Instructor, DIMEG, University of Calabria. Classes taught: Mechanics of Materials (undergraduate level), Finite Element Analysis of Solids and Structures (graduate level).
- 2007 - 2008: Adjunct Assistant Professor, Department of Mechanical Engineering, University of Calabria, Italy. Classes taught: Measurement and Instrumentations (undergraduate level), Elements of Mechanical Design (graduate level)
- 2003 - 2006: Teaching Assistant, Department of Mechanical Engineering, University of Calabria, Italy.

Current students

-Chiara Morano, PhD student at University of Calabria. Advisor in formal capacity. Research Topic: Mechanics of bio-inspired interfaces.
-Ran Tao, PhD student at KAUST, Saudi Arabia. Co-advisor in formal capacity (with Gilles Lubineau). Research Topic: Tuning bridging effect in fiber reinforced composite laminates using pulsed laser micromachining.
-Matteo Scagliola, MS student at University of Calabria. Research Topic: Cohesive zone models for bio-inspired interfaces.
-Daniele Tedesco, MS student at University of Calabria. Research Topic: Analysis of IR heating in adhesive bonded BIW (Research Intern at CRF-FCA, Melfi, Italy).

Past students

-Giovanna Rotella, Post-Doctoral Student at University of Calabria. Advisor in formal capacity. Topic: Development of surface preparation strategies for enhanced adhesive bonding of metals. Completed on April 2014. Currently Research Fellow at the Department of Materials Science, University of Calabria.
-Ali Shaghaghi Moghaddam, PhD Student at K. N. Toosi University, Teheran, Iran. Co-advisor in formal capacity (with

Prof. R. Ghajar). Topic: Analysis of fracture in functionally graded materials. Dissertation defended on January 24th 2011. Currently Assistant Professor at Azad University, Takestan, Iran.

-Roberta Vaccarella, MS student at University of Calabria. Research Topic: Mechanics of bio-inspired interlocking interfaces. July 2017.

-Giovanni Bassano, MS student in ME at University of Calabria, advisor in formal capacity. Topic: Experimental analysis of adhesive joints for the automotive industry, May 2017. Currently at Bosch Automotive, Bologna, Italy.

-Edwin Hernandez, MS student in ME at KAUST, co-advisor in formal capacity (with Gilles Lubineau). Topic: Experimental and numerical analysis of debonding in copper/epoxy joints, August 2015. Currently at GE Aviation, Mexico.

-Ettore Lappano. MS Student in ME at Univ. of Calabria, advisor in formal capacity. Topic: Modeling failure across bio-inspired interfaces, May 2013. Currently PhD Student at KU Leuven, Belgium.

-Mingmin Song, MS student in ME at KAUST, co-advisor in formal capacity (with Gilles Lubineau). Topic: Modeling of hydrogen induced cracking using cohesive elements, December 2011. Currently Research Engineer at SABIC China.

Co-advisor in formal capacity of several BSc students in Mechanical Engineering at University of Calabria (names available upon request).

Past visiting students and scholars

-Milad Hemmatnezhad, Post-Doctoral Student, Tarbiat Modares University, Iran, May-October 2014.

-Vishal Bansal and Yashika Sindhu, BSc students at IIT Dheli, Summer 2014.

-Aayush Singh and Devang Yadav, BSc students at IIT Dheli, Summer 2013.

-Sahil Aggarwal, Shashant Shekhar, Vibhor Gupta, Nimit Bindal, BSc students at IIT Dheli, Summer 2012.

Research Projects

He is acting (or he acted) as a Principal Investigator in the following projects:

- 01/04/2018-31/03/2021: KAUST Competitive Research Grant (CRG 2017). *Removing the bottlenecks in composite joint designs: ensuring mechanical performance and safety via engineered interfacial morphology*. Co-Pi with Gilles Lubineau. Total funding: 800k USD, funding allocated at UNICAL: 200k USD.
- 07/2015-09/2017: *Campus Manufacturing: Development of innovative surface preparation techniques for enhanced adhesive bonding of automotive body in white (BIW)*. In collaboration with Fiat-Chrysler Automobile (FCA), Melfi, Italy. Approx 100k EUR.
- 11/2013-04/2015: *Tailoring interfacial fracture of advanced materials through multi-scale surface modification*, PO Calabria FSE 2007-2013 - ASSE IV - Capitale Umano. In collaboration with TU/Dresden. Approx 38k EUR.

International Cooperation Network

- D. Lonardo, D. Spennacchio, Campus Lab, Centro Ricerche FIAT, Melfi, Italy, 2015-present; topic: adhesive bonding of automotive BIW parts.
- John Botsis, Ecole Polytechnique Federale de Lausanne, Switzerland, 2015-present; topic: multi-scale analysis of delamination in composite materials.
- Kyoungsoo Park, Yonsei University, South Korea, since 2015; topic: computational fracture mechanics (research and teaching level).
- Irene Jansen, Sebastien Pap and Tom Schiefer, Fraunhofer IWS-Dresden, Germany, since 2013; topic: laser surface modifications of metals for improved adhesive bonding.
- Gilles Lubineau, King Abdullah University of Science and Technology, since 2010; topic: mechanics of interfacial debonding, computational fracture mechanics, mechanics of adhesive bonded composite joints.
- Glaucio Paulino, Georgia Institute of Technology, since 2006; topic: computational fracture mechanics.

Invited Presentations

- Damage tolerant architected interfaces for adhesive bonded lightweight materials, University of Waterloo, Waterloo (Canada), 21/06/2018. (Hosted by Prof. J. Huissoon)
- Advanced strategies for joining metals and composites using adhesive bonding, Airbus Operations GMBH,

- Hamburg, 27/02/2017. (Hosted by Dr. D. Furfari)
- Adhesive Bonding of Advanced Materials: technology and applications. The Hochschule Bochum - Bochum University of Applied Sciences, Germany, 28/11/2016. (Invited by Prof. F. Janzen)
- Analysis of delamination in composite materials using the cohesive zone model of fracture. Ecole Polytechnique Federale de Lausanne, Switzerland, 24/09/2015 (Invited by Prof. John Botsis)
- Improving adhesion and work of fracture through controlled surface heterogeneities. Ecole Polytechnique Federale de Lausanne, Switzerland, 21/01/2015. (Invited by Prof. John Botsis)
- Tailoring interfacial fracture of advanced materials through multi-scale surface modification. TU/Dresden, Germany, 10/12/2014. (Hosted by Dr. I. Jansen)
- Adhesion at interfaces with spatially heterogeneous surface properties. Fraunhofer-IWS, Dresden Germany, 9/12/2014. (Hosted by Prof. F. Lasagni)
- Enhancing adhesive bonding by laser surface irradiation: an integrated experimental-numerical approach, Khalifa University of Science, Technology & Research, Abu Dhabi, United Arab Emirates, 19/10/2011. (Invited by Prof. Andreas Policarpou)
- Development, finite element simulation and parameters identification of adhesive bonded interfaces, ME Seminars Series, King Abdullah University of Science and Technology, Thuwal, Saudi Arabia, 05/04/2011. (Hosted by Prof. G. Lubineau)
- Modelling and Design Criteria for adhesive bonded joints. The Hochschule Bochum - Bochum University of Applied Sciences, Germany, 02/12/2008. (Invited by Prof. F. Janzen)
- Elastic characterization of engineering materials using dynamic methods, LMS International Company - Engineering Innovation, Leuven, Belgium, 23/06/2008. (Hosted by Dr. S. Donders)
- Analysis of damage and fracture in adhesive joints using the cohesive zone model, University of Southampton, UK, 20/06/2008 (<http://www.soton.ac.uk/as7/seminars.htm>). (Hosted by Prof. S. Syngellakis)
- Analysis of the interfacial fracture toughness of an Al/Epoxy joint, Henkel International Meeting, Politecnico di Torino, Vercelli, 26/06/2006. (Hosted by Prof. G. Belingardi).

Presentations given in conferences and workshops

- BIOM&M, First International Conference on Materials, Mimicking, Manufacturing from and for Bio Application. 27th-29th June, 2018, Politecnico di Milano, Italy
- Workshop: Advances on Joining Technologies, University of Messina, Italy 5/04/2018.
- 46° Convegno Nazionale dell'Associazione Italiana per l'Analisi delle Sollecitazioni, Pisa (Italy), 6-9/09/2017.
- Workshop: Advances on Joining Technologies, University of Padua, 20/04/2017.
- 45° Convegno Nazionale dell'Associazione Italiana per l'Analisi delle Sollecitazioni, Trieste (Italy), 7-10/09/2016.
- Workshop: La sorgente STAR e le potenzialità della microtomografia a contrasto di fase all'UNICAL, Aula Seminari, Dipartimento di Fisica, Università della Calabria, 22/07/2016.
- Workshop: Advances on Joining Technologies, University of Calabria, 1/04/2016.
- KAUST Research Conference: Research Trends in Predicting and Monitoring the Integrity of Composites (COMINT), KAUST, Thuwal, 1-2/06/2015.
- Workshop: Advances on Joining Technologies, University of Ferrara, April 10th 2015.
- MM&FGMs Conference, Sao Paulo, Brazil, 19-22/10/2014.
- XI World Congress on Computational Mechanics (WCCM XI), Barcelona, 20-25/07/2014.
- Workshop Advances on Joining Technologies, University of Salerno, 11/07/2013.
- KAUST International Workshop on Computational and Experimental Mechanics of Advanced Materials, KAUST, Thuwal, 1-3/07/2013.
- European Adhesion Conference (EURADH 2012), Friedrichshafen, Germany, 16-20/07/2012, (poster presentation).
- XLI Convegno Nazionale dell'Associazione Italiana per l'Analisi delle Sollecitazioni, Vicenza (Italy), 5-8/09/2012.
- World Congress on Computational Mechanics, Sao Paulo, Brazil, 8-13/07/2012.
- Workshop Advances on Joining Technologies, University of Padua, 12/04/2012.
- International Conference on the Mechanical Behavior of Materials, ICM11, Como, 5-9/06/2011.
- Workshop Advances on Joining Technologies, Alma Mater University of Bologna, 8/04/2011.
- U.S. National Conference on Computational Mechanics, Minneapolis (MN), 25-29/07/2011.
- U.S. National Conference on Computational Mechanics, Columbus (OH), 16-19/07/2009.
- XXXVII Convegno Nazionale dell'Associazione Italiana per l'Analisi delle Sollecitazioni, Università di Roma La Sapienza, 10-13/09/2008.
- International Conference on Fracture and Damage Mechanics, Madeira, Portugal, 17-19/07/2007.

- XVIII Convegno Nazionale del Gruppo Italiano Frattura (IGF), Cetraro (Italy), 31/05/2006-1/06/2006.
- Henkel International Meeting, Politecnico di Torino, Vercelli (Italy), 26/06/2006.
- 4th BSSM International Conference on Advances in Experimental Mechanics, University of Southampton, 6-8/09/2005.
- 12th International Conference on Experimental Mechanics (ICEM), Bari (Italy), 29/08/2004-2/09/2004.

Service and Society Memberships

Department service.....

Member of the qualification committee for the admission to the final exams of the Doctoral School in Industrial and Civil Engineering, University of Calabria, 2017.

Member of the admission committee of the Doctoral School in Industrial and Civil Engineering, University of Calabria, 2013.

Member of the steering committee on the degree program in Mechanical Engineering, University of Calabria, 2014-present.

Member of the Student-Faculty committee, degree programs in Mechanical, Energy and Management Engineering, DIMEG, University of Calabria, 2015-present.

Member of the committee of the Doctoral School in Industrial and Civil Engineering, University of Calabria, 2013-present.

Member of the committee of the Doctoral School in Mechanical Engineering, University of Calabria, 2012-2016.

Member of the Learning, Teaching and Quality Committee, Department of Mechanical, Energy and Management Engineering, University of Calabria, 2014-present.

Liason Officer, Agreement of Scientific Cooperation between University of Calabria and the following foreign institutions: Yonsei University, South Korea; Fraunhofer IWS-Dresden, Germany; University of Tehran, Iran.

Editorial Board and Reviewer service.....

- He is *Editorial Board Member* of the Taylor & Francis Journal of Adhesion Science and Technology (2015-), Elsevier International Journal of Adhesion and Adhesives (2018-) and Bentham Recent Patents on Mechanical Engineering (2014-). He is also member of the Editorial Advisory Group at Cambridge Scholar Publishing and Associated Editor of Shock and Vibration (Hindawi).

- He serves as a *Reviewer* for the following international journals: International Journal of Adhesion and Adhesives (Elsevier), Journal of Adhesion Science and Technology (Taylor and Francis), Journal of Adhesion (Taylor and Francis), Mechanics Research Communications (Elsevier), ASME Journal of Applied Mechanics, Journal of Materials Engineering and Performance (Springer), Materials Science and Engineering A (Elsevier), International Journal of Fracture (Springer), Experimental Mechanics (Springer), Journal of Composite Materials, Materials Characterization (Elsevier), Meccanica (Springer), Engineering Fracture Mechanics (Elsevier), Materials and Design (Elsevier), International Journal of Mechanical Sciences (Elsevier), Journal of Materials Science (Springer), Surface and Coatings Technology (Elsevier), ASME Journal of Vibration and Acoustic, Strain (Wiley-Blackwell), Journal of the Acoustical Society of America, Heliyon (Elsevier).

- He acted as *Guest Editor*, with Stelios Kyriakides (University of Texas at Austin), Gilles Lubineau (KAUST) and Glaucio Paulino (Georgia Institute of Technology, GAtech), of the special issue of the International Journal of Solids and Structures (Elsevier) devoted to the CEMAM 2013.

- Academic Nominee for the QS Intelligence Unit (QSIU) Global Academic Survey at K. N. Toosi University of Technology, Tehran, Iran.

- External examiner (jury member) for the PhD dissertation entitled *Model order reduction techniques for linear and nonlinear structural problems*. Student: Ettore Lappano, KU Leuven, June 12th 2017.

- External examiner (jury member) for the PhD dissertation entitled *Effect of an adhesive layer on the mode I delamination in unidirectional CFRP bonded joints*. Student: Nassima Nasri. Ecole Polytechnique Federale de Lausanne, May 29th 2017.

- External examiner (jury member) for the PhD dissertation entitled *Bridging effects on Mixed Mode delamination*:

experimental tests and numerical simulation. Student: Marco Borotto. Ecole Polytechnique Federale de Lausanne, May 10th 2016.

- Panelist, Division of Civil, Mechanical and Manufacturing Innovation (CMMI), National Science Foundation (NSF), Arlington, Washington DC, VA, 22230-0002, July 2011.
- Ad-hoc Reviewer, *ibidem*, September 2011.

Society memberships.....

- o British Society for Strain Measurement (BSSM)
- o ASME Committee on Computing in Applied Mechanics (CONCAM)
- o Italian Association for Stress Analysis (AIAS).

Conferences and Workshops Organizing.....

- o Member of the Scientific Committee, 1th First International Conference on Materials, Mimicking, Manufacturing from and for Bio Application, 27th-29th June, 2018, Politecnico di Milano, Italy (<http://biomm.org>)
- o Organizer and chair, Workshop Progressi della Ricerca Italiana sui Sistemi di Giunzione, Universita' della Calabria, Rende (CS), Italy, March 31st-April 1st 2016.
- o Co-organizer and co-chair with Gilles Lubineau (KAUST) and John Botsis (EPFL, Lausanne), KAUST Research Conference, Recent Trends in Predicting and Monitoring the Integrity of Composites (COMINT 2015), KAUST, Thuwal, Jeddah, June 2nd-3rd, 2015.
- o Member of the International Scientific Committee, 13th International Symposium on Multiscale, Multifunctional and Functionally Graded Materials (MM&FGM2014), Sao Paulo, October 19th-22nd, 2014.
- o Co-organizer and Co-Chair of the Mini-symposia entitled, Multiscale and Multifunctional Composites: Design and Identification, 13th International Symposium on Multiscale, Multifunctional and Functionally Graded Materials (MM&FGM2014), Sao Paulo, October 19th-22nd, 2014 (<http://mmfgm2014.org/node/23>).
- o Co-organizer and Chair of the Mini-symposia entitled, Computational Damage Mechanics of Composite Materials, within the World Congress on Computational Mechanics - WCCM XI (<http://www.wccm-eccm-ecfd2014.org/>), July 20th-25th, 2014, Barcelona, Spain.
- o Co-organizer and co-chair with Gilles Lubineau (KAUST) and Glaucio Paulino (UIUC), KAUST International Workshop on Computational and Experimental Mechanics of Advanced Materials (CEMAM), KAUST, Thuwal, Jeddah, July 1st-3rd, 2013 (<http://www.kaust.edu.sa/media/symposiums/cemam/index.html>).
- o Co-organizer and Co-Chair of the Mini-symposia entitled, Computational Damage Mechanics of Composite Materials, within the World Congress on Computational Mechanics (<http://www.wccm2012.com/>), July 8th-13th, 2012, Sao Paulo, Brazil.
- o Co-organizer and Chair of the Mini-symposia entitled, Fundamentals of Cohesive Zone Models, within the International Conference on the Mechanical Behavior of Materials (<http://www.icm11.org/>), June 5th-9th 2011, Lake Como, Italy.

List of Publications

Items submitted and/or in preparation.....

- R. Tao, M. Alfano, G. Lubineau, In situ analysis of interfacial damage in adhesively bonded composite joints subjected to various surface pretreatments. Submitted.
- M. Alfano, C. Morano, F. Moroni, F. Musiari, D. Lonardo, D. Spennacchio, Fracture toughness of structural adhesives for the automotive industry. Submitted.
- M. Borotto, J. Cugnoni, M. Alfano, J. Botsis, Analysis of mixed mode delamination in CFRP using the cohesive zone model and FBGs strain measurements. In preparation.
- M. Alfano, L. Bruno, C. Morano, M. Muzzupappa, L. Pagnotta, Analysis of crack trapping across bio-inspired interfaces: feasibility study using 3D printing. In preparation.

International Journals (indexed by Thomson Reuters Web of Science).....

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Rende, October 3rd 2018

Marco Alfano



بخشی از ماشین آلات موجود در کارخانه:

ابعاد کارگیر (mm)	سازنده	نام دستگاه
3200x1400	روسیه	دستگاه کاروسل دروازه ای
1600x800	روسیه	دستگاه کاروسل N.C
1500x800	ایران	پرس ۲۰۰ تنی
500x300	ایران	پرس ۱۰۰ تنی
400	ایران	اره لنگ
260	ایتالیا	اره نواری
0x1800	چینی	دریل رادیال
700x50	روسیه	تراش C39-CNC
2000x20	روسیه	نورد سه غلطکه
1500x1000	آلمان	مولتی اسپیندل ۳۲ محور
28-16	ایران	قلاویز زن اتوماتیک
	ایران	دریل ستونی M20-32
700x500	روسیه	هشت ایستگاهی
500x2000	بلغارستان	تراش ۲ متری C11MT
500x1500	ایران	تراش انیورسال
500x2000	ایران	تراش انیورسال
	چک اسلواکی	دینام جوش سه فاز
	ایران	تراش جوش تک فاز
۳ تن	ایران	لیفتراک
۵ تن	آلمان	جرثقیل سقفی
320x710	ایران	صفحه تراش
351x530	لهستان	فرز انیورسال
400x900	لهستان	فرز انیورسال
1800x1600x125	روسیه	یورینگ
1000x5000	روسیه	تراش سنگین
900x3000	رومانی	تراش TPK 90
700x300	ایران	تراش TN71

دستگاه های آزمایشگاهی برای کنترل ابعادی ، سختی ، آنالیز و



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About The Company

RADCO Commercial, Engineering and Consultant Startup company is an entrepreneurial venture which aims to provide state of the art engineering products for the smart repair of onshore and offshore pipelines and structures. The company launched in 2018 to offer Reliable, Available, Durable, Cost-effective and Original (RADCO) products to reduce cost and time of pipeline repair. Furthermore, the supervision services to oversee the successful deployment and installation of the products will be provided. With total control of the manufacturing process, RADCO is able to design and develop repair systems specifically tailored to individual client projects. RADCO offers products which justify the following benefits:

- Elimination of the need for costly pipeline shutdowns.
- Offering very competitive prices compared to similar products.
- Presenting innovative products as per client's necessity.
- Repairing when the integrity has been compromised.
- Saving the installation dead time.

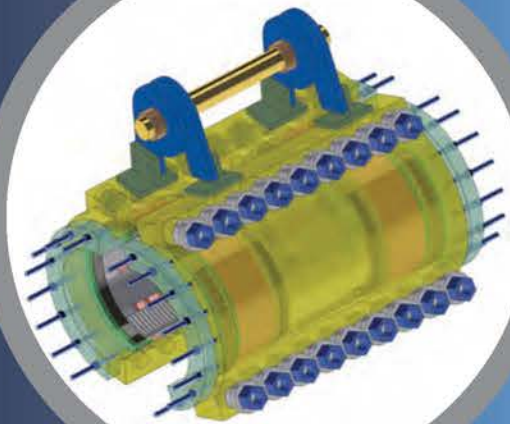
A range of pipeline repair products are supplied including:

- Leak repair products.
- Tie in products.
- Hydraulic pipe to pipe Connectors.



Smart Clamp

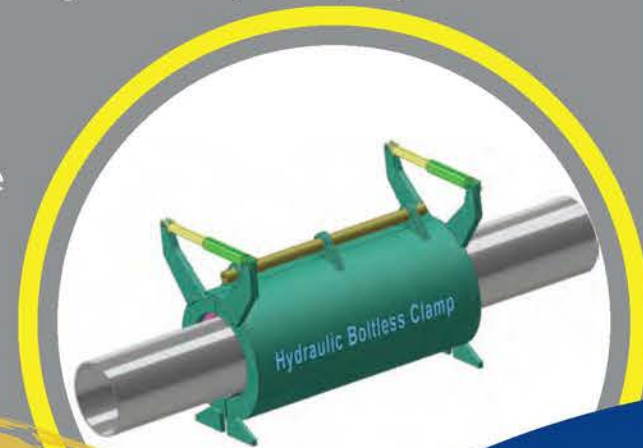
Smart Clamps are split mechanical fittings used to repair a damaged or leaking subsea pipeline. The fittings are available in structural and non-structural versions. The non-structural versions may be used to repair a pipeline that has only minor damage such as pinhole leaks, local pipe wall thinning or shallow dents. The structural versions, replace structural integrity in more severely damaged pipelines with cracked girth welds, kinks, or punctures.



Hydraulic Smart Clamp

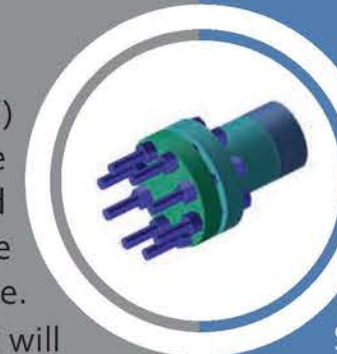
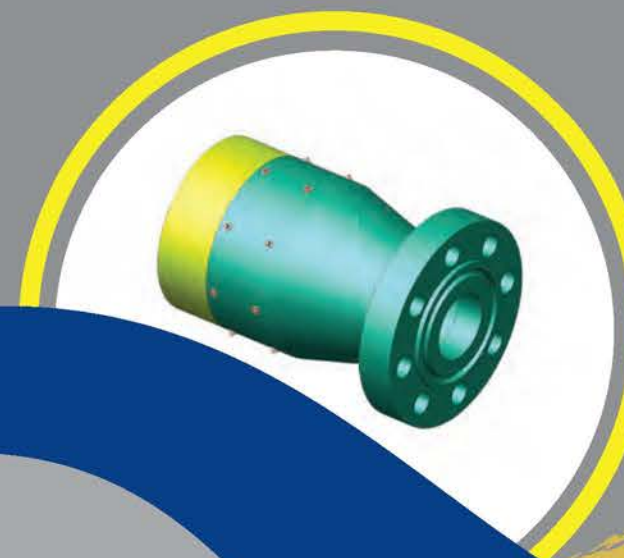
Hydraulic Activated Smart Clamps are innovative products designed to eliminate the time consuming bolt tightening procedure. These products are supplied in both sealing and structural models.

- Very fast installation and activation
- Less operation cost
- Positive mechanical locking mechanism
- Dual seals for long term integrity
- Elimination of the time consuming bolt tightening procedure
- Tolerating high bending and axial force



Hydraulic Smart Flange

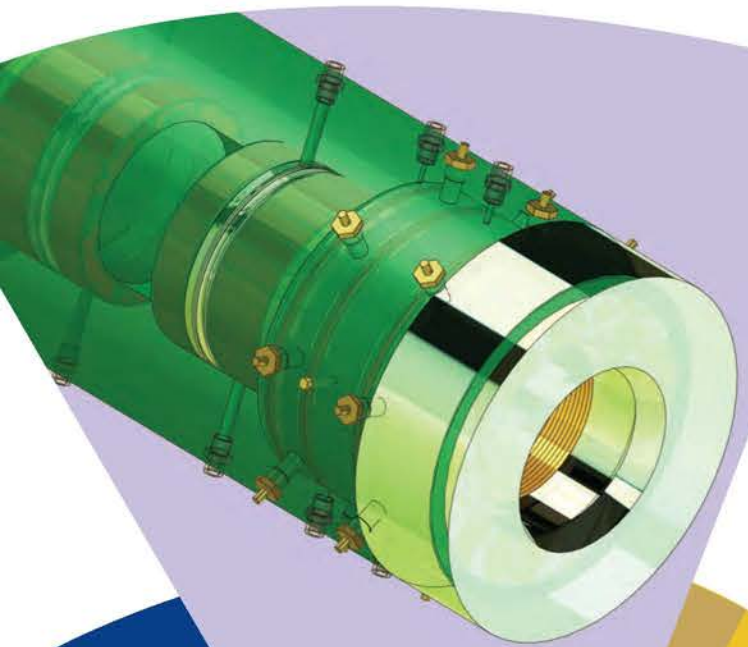
Hydraulic Smart Flanges (HSF) are hydraulically-set smart flange connectors in which sealing and gripping mechanisms are activated by hydraulic pressure. When actuated, HSF Connectors will structurally attach to and seal against the pipe. HSF Connectors can be designed in sizes and pressure ratings to meet any customer requirements.



Smart Flange

Smart Flanges are mechanical pipe end connectors which utilizes grips that mechanically attach to a pipe and create a permanent, structural flanged end on the pipe. A dual seal are considered to deliver long-term integrity and comes equipped with a test port to verify the annulus seal. The connectors are capable of withstanding full pipeline axial, bending and torsional loads while withstanding hydrostatic loads from the pipeline.

- Pipeline Repairs
- Pipeline Reroutes
- Pipeline Abandonments
- Riser Repairs



Smart Hydraulic Pipe to Pipe Connector

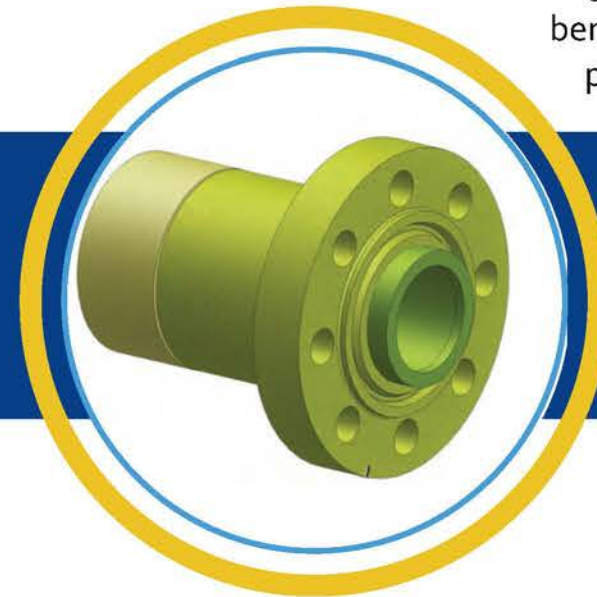
Smart Hydraulic Pipe to Pipe Connectors are designed to provide structural connection against both pipe ends. These products eliminate the use of flange-flange or flange-smart flange connections for tie in and then significantly reduce repair dead time. In order to complete a pipeline repair, both pipeline ends are cut and beveled. Then the pipe to pipe connector is fully replaced on the pipeline at one side. The operator then reacts against the connector and move it until the half of the connector is stabbed over the bare pipe. Once stabbed, the operator starts setting the sealing and gripping mechanism on both pipe ends by hydraulic pressure. After installation, the annulus test will be performed on two test ports available on the products.

- Very fast installation
- Tie in application
- Used with mid spool
- Riser Repairs
- Structural Repairs

Products Technical Specification

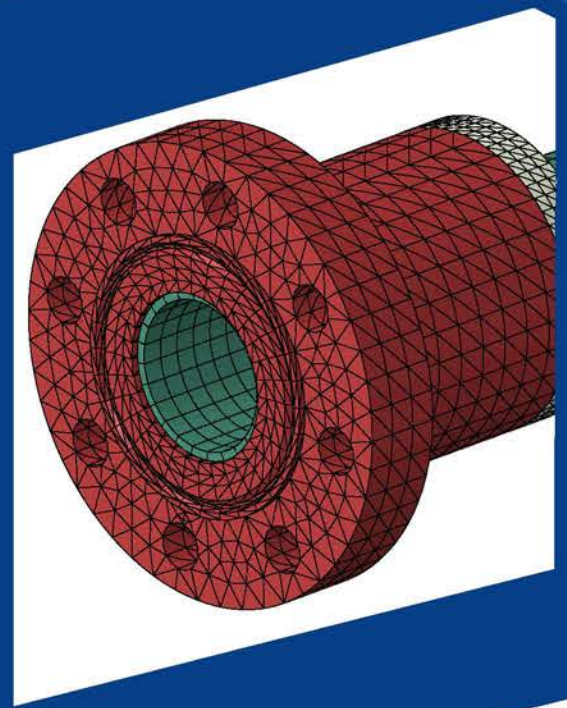
Customized designs are performed in order to tailor the following technical specifications for the offshore and onshore pipelines.

- Less installation dead time.
- Very fast installation time for hydraulic activated models.
- Diver friendly products to ease the installation.
- Less dependency of the installation to the operator.
- Optional grouting and filling ports.
- Inboard seals & outboard grips for NACE compliance (for sour service).
- Dual seals for long term integrity and to enable annulus pressure verification test.
- Smart mechanism to prevent seals failure during installation.
- Typical backup rings to prevent seal extrusion under high internal pressure.
- Longer gripper area to withstand full pipeline axial, bending, and torsional loads while maintaining full line pressure integrity.



The design of the clamps, flanges and connectors will be in accordance with ASME VIII div 2, ASME PCC2 and verified against DNV-RP113, Recommended Practice for Pipeline Repair. General Design considerations are listed below:

Design Philosophy



- Products are designed to be used on pipe that meets the tolerances and ovality listed in API 5L.
- Nominal Pipe Size of any API Specification 5L pipe , e.g. 4inch and 32 inch, wall thickness and grade are considered.
- Design Temperature Range is considered as (0°C) to (100°C).
- Products will be applicable for standard service such as crude oil, natural gas, hydrocarbons, sour service, water or chemical injection, etc.
- Smart Clamps incorporate sacrificial anodes to provide cathodic protection.
- Dual seals each end would be supplied to enable a pressure verification test.

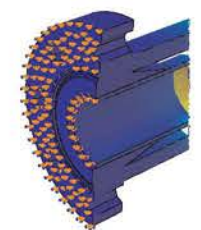
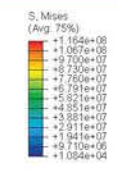
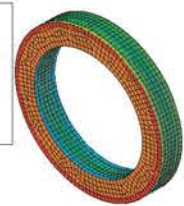
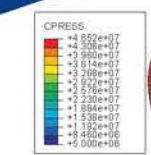
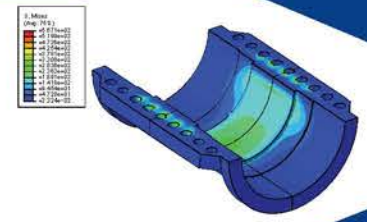
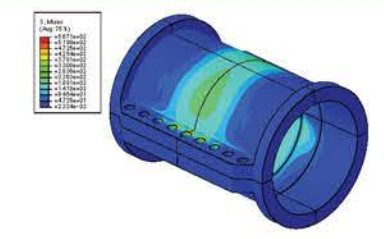
- Typical innovative products design according to client requirement.
- Pilot design of installation set up on the workshop to brief installation team.
- Subcontract international consulting companied to provide solutions and products for any unpredicted failure.

Engineering Support

- Failure analysis of any pipeline leaks and full bore ruptures.
- Comprehensive FE Analysis for any client requirements.
- On site engineering support for product installation.

Detail design

A range of products are designed and supplied to modify repair operation in terms of time and cost. Moreover, customized designs will be performed according to the client specific requirement. A detail design will be performed including FEA analysis of the product and hand calculations with respect to accepted codes and standards. All 3D models and detail drawings are generated using SolidWorks and AutoCAD. FEA analyses are performed by Abaqus and other respective softwares. Upon request, detail finite element analysis for typical circumstance stated in DNV standards, BS 7910 and other standards will be conducted, e.g. ECA.



Manufacturing

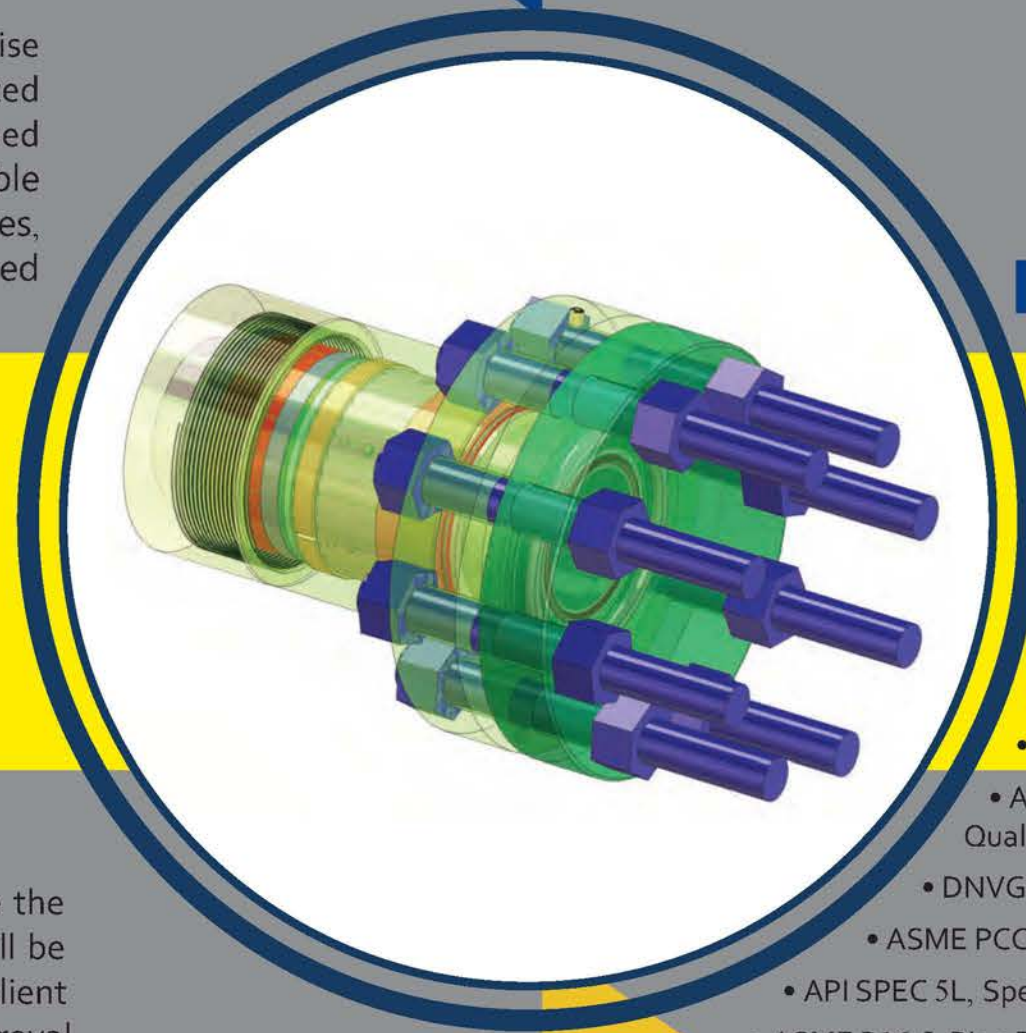
Manufacturing are performed by CNC and high precise machining tools. All manufactured components are subjected to %100 inspection and quality control. All machined components will be done by the following facilities available at the main workshop. For typical circumstances, machining would be outsourced to approved manufacturers.

- Heavy duty floor type NC boring
- Heavy duty milling
- Heavy duty lathe machining
- Heavy duty carousel machining
- Casting utilities
- Heavy duty plate rolling machine

Testing and Inspection

Products will be subjected to a FAT test to demonstrate the intended and required functionality are met. All testing will be performed by competent persons in the presence of the client and third party. The FAT procedure will be submitted for approval prior to commencing of any tests. Testing shall include:

- Proper assembly and interaction between internal components
- Activation
- Hydrostatic test
- Proper overall functionality



Industry standard references

- API SPEC 6H, Specification on End Closures, Connectors and Swivels.
- ASME Boiler and Pressure Vessel Code, Section VIII, Division 1 and 2.
- NACE MR 0175, Part1 & Part2 (resist sulfide stress cracking).
- ASME B31.8, Gas Transmission and Distribution Piping System.
- ASME B31.4, Piping Transportation System for Liquid Hydrocarbons and other Liquids.
- DNV RP-F113, Pipeline Subsea Repair.
- DNV Recommended Practice RP B401, Cathodic Protection Design.
- ASME Boiler and Pressure Vessel Code, Section IX Welding and Brazing Qualifications.
- DNVGL-RP-F113, Pipeline Subsea Repair - Rules and Standards.
- ASME PCC1, Guidelines for Pressure Boundary Bolted Flange Joint Assembly.
- API SPEC 5L, Specification for Line Pipe.
- ASME B16.5, Pipe Flanges and Flanged Fittings.
- ASME B31G, Manual for Determining the Remaining Strength of Corroded Pipelines.
- ASME PCC2, Repair of Pressure Equipment and Piping.
- DNV-OS-F101, Submarine Pipeline Systems.



Test Certificate

Document Code: F-238/01

Certificate No.: CRT/YA18/0133/LV/01

We hereby certify that the item in the following was tested by our Inspector.

Manufacturer: Mahrads Sanat Khalagh (Radco) company

Place of test: Qazvin, Takestan

Date of test: 26 Jul.2018

Test report No.: R/YA18/0133/LV/01 Rev.00

Items: Smart Flange
Smart Hydraulic Pipe to Pipe Connector

Scope of Inspection and Testing:

Performance verification Hydro testing as:

- Main Test for 4-inch Smart Flange (RADCO 2018-1) /pressure Test:340 bar
- Annulus Test for 4-inch Smart Flange (RADCO 2018-1) /pressure Test:350 bar
- Annulus test of one side of Smart Hydraulic Pipe to Pipe Connector with two separable sides(RADCO 2018-2) /pressure Test:300 bar

Result(s) of Inspection and Testing:

TEST PASSED AND ACCEPTABLE

Intended for: N/A
Customer's order No.: N/A
Manufacturer's order No.: 1392-370
Place and date: Tehran 01.Aug.2018

