BLADE ENERGY PARTNERS

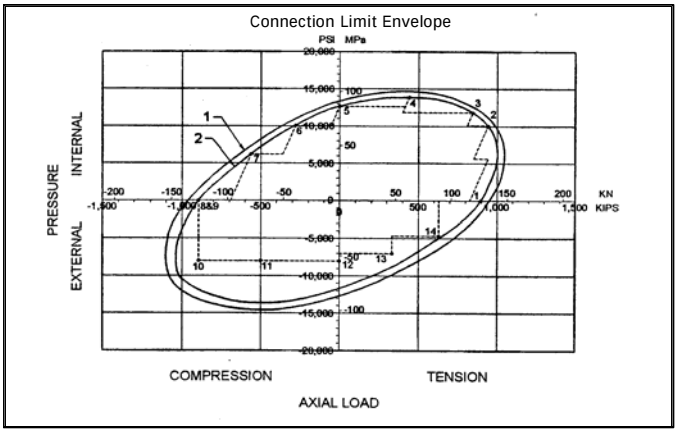
Training Course
Advanced Casing Design

As wells become increasingly more challenging, so must design tools become more sophisticated to adequately balance cost and risk. Learn how to prepare non-traditional reliability-based casing designs and implement the recent dramatic changes to API5C3/ISO10400

Traditional tubular design methods aren't up to task for many complex wells. However, new and proven reliability-based design tools are available, and API/ISO have developed new limit-state, probabilistic methods for determining pipe performance properties, thereby moving away from the deterministic methods that have been used by the industry for decades. This course provides practical tools to prepare the engineer for the more challenging and demanding well designs needed for HPHT, Deepwater, and other critical wells at the extremes of pressure and temperature. Among the unique features of this course are:

- Advanced strength theories, including API5C3 / ISO-DIS 10400 limit states.
- API 5C3 / ISO-DIS 10400 probabilistic performance properties and strength considerations in design.
- Reliability-based design and Quantitative Risk Analysis applied to design.
- Design and selection of connections with emphasis on the ISO13679 approach to connection limits.
- Materials selection and fracture mechanics criteria for sour design (including ISO- DIS 10400 sour limits).
- Special problems in casing design, including buckling, thermal effects, annular pressure build-up, wellhead movement, casing wear, thermal cyclic service, subsidence, and more.
- Use of standard casing design programs to address advanced casing design problems.
- Development of designs based on a quantifiable probability of failure instead of traditional safety factors which typically provide little insight into a design's reliability.

Strength Results			
API	API Pipe Body Tension	1,040	klbf
	API Burst Pressure (p_{burst})	6,870	psi
	API Collapse Strength (P_{Collp})	7,120	psi
	Collapse Mode	Yield	
VME	VME Burst Strength		
	Capped-End Yield	8,222	psi
	Full Plasticization	10,041	psi
	VME Burst with 12-1/2% Wall Reduction		
	Capped-End Yield	7,194	psi
	Full Plasticization	8,786	psi
	VME Stresses		
@ ID	Radial Stress (σ_r)	-583	psi
	Hoop Stress (σ_t)	-55,296	psi
	VME Stress	55,006	psi
@ OD	Radial Stress (σ_r)	-9,858	psi
	Hoop Stress (σ_t)	-46,020	psi
	VME Stress	41,969	psi
	Hill Burst	10040	psi
	Klever-Stewart Burst	10620	psi
	Tamano Collapse	8220	psi



Who Should Attend

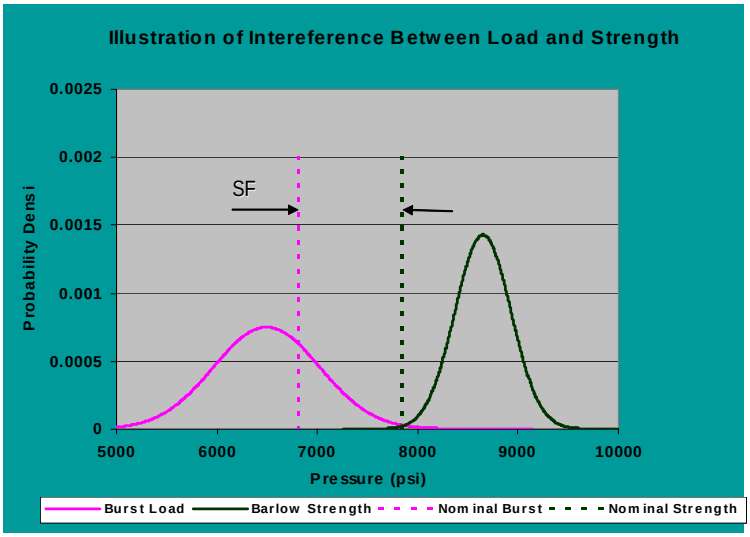
Targeting engineers in operating companies, this course is the first available to operators addressing advanced concepts and issues, and recent developments in casing design.

Highly Qualified Instructors

The course is taught by industry respected experts who have planned and executed some of the most challenging underbalanced wells in the industry.

Course Includes

The course includes a comprehensive manual and several sophisticated spreadsheets for calculating loads and performance properties, numerous practical examples are used to illustrate the design process. The course can be customized to specific client needs for in-house training.



Customizing This Course

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Course Agenda

Day 1	• Introduction to casing design • Failure criteria and theories of strength - Historical API strength - Limit states for burst and collapse (including ISO 10400) - Combined loading- VME & limit states - Probabilistic strength consideration • Estimation of loads - standard and non-standard load types; estimation exercises and examples	**Day 2**	• Design process - Working Stress Design - Probabilistic Design- Probabilistic strength - Intro to Quantitative Risk Analysis; examples - Load and Resistance Factor Design • Design of connections - API and proprietary connections - Determining limit envelope of connections • ISO 13679 standards and approach
Day 3	• Selection of materials in casing design • Fundamentals of corrosion • Corrosion mitigation; design for corrosion • Fracture Mechanics Approach • Fundamentals of fracture mechanics applied to casing design • Environmentally-assisted cracking and stress intensity • ISO 10400 approach to design for brittle failure and flaws • Use of software products for design	**Day 4**	• Temperature modelling and thermal effects on casing performance • Buckling and post-buckling behaviour of casing • Annular pressure build-up- analysis and mitigation methods • Casing wear and impact of wear on strength • Design for thermal cycling applications • Wellhead motion and formation interface effects • Effect of subsidence on casing

Schedule and Cost

Courses are coordinatied in partnership with the PetroSkills training alliance which includes ARAMCO, BP, Chevron, ConocoPhillips, Halliburton, Oxy, Marathon, Repsol and Shell as members. Please go to WWW.PETROSKILLS.COM for course schedule and rates.