KEE ENERGY EQUIPMENT
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TUBULAR AND CONNECTION INDICATIONS

TUBE AND BODY INDICATIONS			
PROBLEM	USUAL EFFECT	PROBABLE CAUSE	POSSIBLE CORRECTION
WASHOUT: usually occurs near pin end upset taper or in area from lower part of slip area to box end upset taper.	Hole in pipe, drop in mud pressure, string separation, lost time.	Surface notching, cyclic stressing, fatigue cracking.	Minimize surface notching, reduce stress level, avoid critical rotary speed. Move bottom hole pipe up hole on trips, taper transition zone, use shock subs.
TWIST OFF: usually occurs near pin end upset taper or in area from lower part of slip area to box end upset taper.	String separation, fishing job, lost time.	Surface notching, cyclic stressing, fatigue cracking.	Minimize surface notching, reduce stress level, avoid critical rotary speed. Move bottom hole pipe up hole on trips, taper transition zone, use shock subs.
FATIGUE CRACKING: predominantly found near pin end upset taper and in and area from box end upset taper to lower part of slip are.	Washout, twist off, string separation, lost time, pipe loss.	Cyclic stressing, surface notches (corrosion, cuts, etc.), hydrogen embrittlement.	Dampen stress, avoid critical rotary speed, minimize surface notching, move bottom hole pipe up hole on trips, use shock subs, prevent H2S in flow. Use lowest strength pipe where possible. Minimize rate of change in hole deviation.
Surface notching – CORROSION PITTING: general in location.	Bodywall loss, localized surface notch, stress concentration	Water, oxygen, CO_2, H_2S and stress	Maintain mud pH above 9.5, plastic coating inhibition oxygen scavenger, clean pipe ID & OD, dampen stress monitor with corrosion test rings.
Surface notching – SLIP CUTS: located in slip area.	Transverse surface notch, stress concentrator.	Pipe turning in slips, defective slips/bowl, improper slip handling.	Use back-up tong for make-up and breakout, use care when spinning pipe with rotary, improve slip/bowl maintenance, use care while setting slips.

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PROBLEM	USUAL EFFECT	PROBABLE CAUSE	POSSIBLE CORRECTION
Surface notching - SLIP AREA MASH: located in slip area.	Surface impression, stress concentrator.	Defective slip component, improper slip handling, excessive connection make-up or breakout, bending pipe in slips.	Improve slip/bowl maintenance, use care while setting slips. Consult API- RP7G, Fig.5.1 for maximum height setting of tool joints above slips.
Surface notching – TONG CUTS: usually located near pin and box end upsets.	Multiple surface notches, stress concentrators.	Tongs placed on pipe, worn tool joints, improper tong jaws, poor handling.	Place tongs only on tool joint, maintain tool joint diameter, use only correct tong jaws, use sharp tong dies.
Surface notching – CHAIN CUTS: usually found in an area over and just above pin end upset.	Circumferential grooves (notch) at pin end upset area stress concentrators, cold worked metal.	Excessive spinning chain slip.	Proper chain tension, consider use of power pipe spinner.
Surface notching – RUBBER CUT EXTERNAL RING CORROSION: usually found in area approximately 2 feet above pin end tool joint.	Circumferential groove, stress concentrator.	Corrosion/erosion at ends of drill pipe/casing protector. Poor mud drain/cleaning at protector end.	Periodically move or remove protector, clean pipe at ends and under protector.
Surface notching - HAMMER MARKS: usually found on the tube in areas near the pin and box end tool joints.	Localized surface notch, cold worked metal.	Tapping pipe to check fluid level on trip out.	Use brass tipped hammer, tap pipe lightly.
SLIP AREA CRUSHING: located in slip area.	Slip area OD / ID reduction, longitudinal splits in slip area, body wall thinning.	Abrupt setting of slips, defective slip/bowl maintenance, improper slip size.	Stop pipe movement before setting slips, check slip-to-pipe fit, improve maintenance, use only correct slip size.
NECKING: usually located near either or both upsets.	Reduced pipe OD / ID split pipe or tool joint.	Stuck pipe, overpull (stretch), excessive hook load.	Avoid sticking pipe, avoid overpull, consult API-RP7G for load limits per pipe class.

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EXPANSION: usually located above the pin and below the box, which has been backed off.	Expanded OD / ID split pipe or tool joint.	Stuck pipe, internal explosion for back off.	Avoid sticking pipe, minimize explosive force. Be sure explosive is placed in tool joint area, carefully inspect pipe before re-use.
COLLAPSE: usually begins near tube center, often travels toward both ends.	Flattens tube, circulation block, string separation.	Excessive OD pressure, drill stem test, OD wear, ID erosion.	Consult API-RP7G collapse charts per pipe class, minimize OD wear, keep pipe straight, prevent ID erosion with plastic coating.
O.D. WEAR: usually appears in center third of pipe body.	Body wall thinning, reduced tensile capacity, reduced cross section, reduced collapse resistance.	Abrasive formations, crooked pipe, deviated hole, high rotary speeds.	Straighten pipe, minimize hole deviation / rate of change, avoid critical rotary speeds.
I.D. EROSION: general location but often appears near upset areas.	Body wall thinning, reduced cross-section, reduced tensile capacity, reduced collapse resistance.	High velocity abrasion, sharp sand (solids), drilling fluid turbulence, general corrosion.	Plastic coating, minimize drilling fluid abrasives, inhibitors, minimize exposure to treating acids.
CROOKED PIPE: most often found in the slip area and center third of pipe body.	Accelerated OD wear in pipe body and tool joint, vibration, high stress level, advanced fatigue.	Bending in slips, setting tool joint too high above slips, improper tong / line geometry, no back up tong on make-up or breakout, poor transportation handling, dropping pipe on racks, critical rotary speeds, picking up pipe with winch line in center, improper drill collar weight.	Consult API-RP7G, Fig. 5.1 for maximum height setting of tool joints above slips, use both tongs, placed 90^0 apart, consult API-RP7G for proper make-up torque per tool joint class, minimize breakout torques, minimize downhole torque, use properly spaced strippers between pipe layers to minimize bending in storage or transit, avoid rough handling when moving pipe, use slings to winch pipe, avoid critical rotary speeds, avoid dropping string.

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TOOL JOINT / CONNECTIONS			
PROBLEM	USUAL EFFECT	PROBABLE CAUSE	POSSIBLE CORRECTION
PIN BREAK: cup type failure.	String separation, fishing job, lost time.	Improper trip make-up torque, additional downhole make-up, improper lubricant producing excessive tension vs. make-up/torque.	Consult API-RP7G charts for proper make-up torque per tool joint class, minimize additional downhole make-up, use recommended rotary tool joint compound.
PIN BREAK: flat fracture type failure	String separation, fishing job, lost time.	Pin wobble due to insufficient make-up, shoulder fins, false torque, fatigue cracking at thread root, galled threads.	Consult API-RP7G charts for proper make-up torque per tool joint class, repair should fins, repair galled threads.
PIN BREAK: flat fracture type failure when torque and make-up are known to be satisfactory.	String separation, fishing job, lost time.	H2S, hydrogen embrittlement, excessive pin tension.	Control H2S in flow, reduce stress level if possible, remove string from service for period of time, inspect tool joint threads.
WASHOUT	Erosion of shoulder (face) seal and threads, mud pressure loss, string separation, lost time.	Leaking shoulder (face) seals, damaged shoulder (face) seals, insufficient make-up torque, galled threads producing excessive shoulder stand-off, shoulder fins rolled between seals, high spots on shoulder – (false make-up torque), excessive shoulder removal by refacing, stretched pin threads, dirty threads and shoulders, miss-stabbing connection, improper jacking of stands in standback area.	Consult API-RP7G charts for proper make-up torque per tool joint class, remove shoulder damage by refacing if possible; recut connection; remove shoulder fins by beveling shoulder, consult API-RP7G section far maximum shoulder removal by refacing. Keep thread protectors installed while picking up, laying down, handling, transporting or storing pipe; clean threads and shoulder before make-up; use care when tripping pipe; use only pipe jack tool with wide area contact.

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DRY OR MUDDY CONNECTION	Leaking shoulder (face) seals.	Insufficient make-up torque, damaged shoulders (face).	Consult API-RP7G charts for proper make-up torque per tool joint class, remove shoulder damage by refacing if possible; recut connection; remove shoulder fins by beveling shoulder, consult API-RP7G section far maximum shoulder removal by refacing. Keep thread protectors installed while picking up, laying down, handling, transporting or storing pipe; clean threads and should before make-up; use care when tripping pipe; use only pipe jack tool with wide area contact.
GALLED SHOULDER	Loss of shoulder seal, excessive shoulder to shoulder standoff, false make-up torque, unstable connection (wobble).	Insufficient lubrication on shoulders, insufficient make-up torque, shoulder fins, high spots on shoulder.	Apply rotary tool joint compound to shoulders when doping connection, remove shoulder fins by beveling shoulder, remove high spots by refacing, consult API-RP7G charts for proper make-up torques per tool joint class.
WEAR: thin shoulders	Reduces torque capacity, belled boxes, reduced shoulder seal area.	Crooked pipe, high rotary speeds, abrasive formations.	Straighten pipe, reduce rotary speeds where possible, apply hardfacing to box end tool joint where possible.
BELLED BOXES	Distorted connection, loss of shoulder seal, will not mate properly with another connection, split body.	Improper make-up torque, additional downhole make-up, thin tool joints, improper thread lubricants.	Maintain tool joint OD, consult API-RP7G charts for proper make-up torque per tool joint class, minimize additional downhole make-up, use only recommended rotary tool joint compound, recut box.

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PROBLEM	USUAL EFFECT	PROBABLE CAUSE	POSSIBLE CORRECTION
STRETCHED PINS	Distorted connection will not mate properly with another connection, possible pin break.	Improper make-up torque, additional downhole make-up, improper thread lubricant.	Maintain tool joint OD, consult API-RP7G charts for proper make-up torque per tool joint class, minimize additional downhole make-up, use only recommended rotary tool joint compound, recut box.
GALLED THREADS	Damages mating threads, false torque, improper make-up, connection wobble, leaking shoulder seal, washout, pin break, drop string, lost time.	Thread damage, handling without thread protectors, cross- threading, worn threads, improper lubrication, dirty connection, defective Kelly saver sub.	Handle pipe only with thread protector, use care in stabbing and make-up recut worn threads, use only recommended rotary tool joint compound, clean connections before use, repair or replace Kelly saver sub.
SHOULDER FINS	Prevents shoulder make-up, false torque, leaking shoulder seal, washout, connection wobble, pin break, drop string, lost time.	Mating tool joints with different OD's, handling damage.	Match tool joint OD's if possible, remove fins by refacing and beveling, handle pipe only with thread protectors.
HEAT CHECK	Tool joint body cracking, washout, string separation, lost time.	Rapid heating due to friction between tool joint and formation, casing whipstock, etc. High rotary speeds, rapid cooling.	Reduce rotary speeds through tight areas, minimize tool-joint-to-formation contact.
SHOULDER DAMAGE	Leaking shoulder seal, washout, string separation, lost time.	Miss-stabbing connection, handling damage, spinning chain between shoulders, improper pipe jacking.	Use care when tripping pipe, handle pipe only with thread protectors, use only pipe jack with wide area contact.

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