PACKING TUBE ISOLATION DEVICE

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ABSTRACT

A packing tube isolation assembly, which includes a first conduit, a second conduit, and a sealing member. The first conduit extends substantially parallel to a longitudinal axis of a tube disposable in a wellbore and has an opening defined in the first conduit. The second conduit fluidly connects to an annulus of the wellbore and to the opening of the first conduit, and is disposed at an angle with respect to the first conduit. The sealing member is disposed adjacent the second conduit and is configured to move into and substantially obstruct the second conduit when the second conduit is at least partially packed with a gravel slurry.
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BACKGROUND

[0001] When a hydrocarbon or other fluid is produced from a subterranean formation, the fluid typically contains particulates or sand. The production of sand from the well is typically controlled in order to extend the life of the well. Gravel packs or screens can be used to filter the particulates of the produced fluids so the fluids without the particulates can be communicated to the surface.

[0002] A challenge to using conventional gravel packing operations arises when the fluid of the gravel slurry prematurely separates from the gravel slurry, leaving the gravel behind. This is known as dehydration. When this occurs, a bridge can form in the slurry flow path, forming a barrier that prevents slurry upstream of the bridge from being communicated downhole. Bridges can also disrupt and possibly prevent the packing of gravel around some parts of the sand screen, for example, leaving areas in the well devoid of gravel packing.

[0003] Another challenge associated with gravel packing operations arises when wellbore equipment, such as a packer, or another obstruction is located within the wellbore. In such cases, the gravel pack conventionally has to be diverted around these obstructions.

[0004] One way of overcoming the challenges presented during gravel packing operations is to provide alternative flow paths around obstructions, such as shunt tubes. A shunt tube can have one or more tubes called transport tubes that can deliver slurry to a number of packing tubes located along the wellbore. When a wellbore section is gravel packed, the packing tubes associated with the wellbore section can also be packed off, allowing gravel slurry flow to be diverted further down the wellbore through the transport tubes. Although the packed packing tube diverts most of the flow down the transport tube, a small amount of the gravel slurry fluid can leak through the transport tube into the packed packing tube. This leakage can cause the gravel slurry remaining in the transport tube to dehydrate and can limit the maximum length of the wellbore that can be packed.

[0005] Additionally, after one or more sections of the wellbore are gravel packed, hydrocarbons can be produced to the surface through the tubing attached to the sand screen. During production, however, the open packing tubes can allow produced fluids to enter the shunt tube system, which can have an adverse affect on the production of hydrocarbons from the wellbore.

[0006] There is a need, therefore, for new apparatus or assemblies that can selectively isolate a transport tube from a packing tube.

SUMMARY

[0007] Embodiments of the disclosure provide an exemplary packing tube isolation assembly, which includes a first conduit, a second conduit, and a sealing member. The first conduit extends substantially parallel to a longitudinal axis of a tube disposable in a wellbore and has an opening defined in the first conduit. The second conduit fluidly connects to an annulus of the wellbore and to the opening of the first conduit, and is disposed at an angle with respect to the first conduit. The sealing member is disposed adjacent the second conduit and is configured to move into and substantially obstruct the second conduit when the second conduit is at least partially packed with a gravel slurry.

[0008] Embodiments of the disclosure also provide a system for gravel packing a well, which includes a tube, first and second packing tube isolation assemblies, and a packer. The tube is at least partially disposed in the well. The first and second packing tube isolation assemblies are disposed around the tube, and each includes a first conduit, a second conduit and a sealing member. The first conduit has an opening formed through a wall thereof. The second conduit is connected to the first conduit around the opening, and is fluid communication therewith and with the well. The sealing member is disposed adjacent the second conduit and is configured to block the second conduit when a pressure differential between the well and the first conduit reaches an activation level. Further, the packer is disposed around the tube, between the first and second packing tube isolation assemblies.

[0009] Embodiments of the disclosure further provide an exemplary method of isolating a packing tube. The exemplary method may include supplying a gravel slurry through a first conduit, and channeling at least a portion of the gravel slurry from the first conduit to a second conduit. The exemplary method may also include distributing the gravel slurry to a portion of an annulus of a wellbore through one or more outlets defined in the second conduit, and actuating a sealing member connected to the second conduit when the second conduit is at least partially packed with gravel slurry. The exemplary method may further include isolating at least a portion of the second conduit from the first conduit with the sealing member.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] So that the recited features can be understood in detail, a more particular description, briefly summarized above, may be had by reference to one or more embodiments, some of which are illustrated in the appended drawings. It is to be noted, however, that the appended drawings illustrate only typical embodiments and are therefore not to be considered limiting of its scope, for the invention may admit to other equally effective embodiments.

[0011] FIG. 1 depicts a cross-sectional view of an illustrative packing tube isolation assembly in a first position, according to one or more embodiments described.

[0012] FIG. 2 depicts a cross-sectional view of the illustrative packing tube isolation assembly of FIG. 1 in a second position, according to one or more embodiments described.

[0013] FIG. 3 depicts a schematic view of an illustrative sand completion system disposed within a wellbore and having two packing tube isolation assemblies, according to one or more embodiments described.

[0014] FIG. 4 depicts a schematic view of the illustrative sand completion system of FIG. 3 with one of the packing tube isolation assemblies in a second position, according to one or more embodiments described.

[0015] FIG. 5 depicts a cross-sectional view of another illustrative packing tube isolation assembly in a first position, according to one or more embodiments described.

[0016] FIG. 6 depicts a cross-sectional view of the illustrative packing tube isolation assembly of FIG. 5 in a second position, according to one or more embodiments described.
[0017] FIG. 7 depicts a cross-sectional view of yet another illustrative packing tube isolation assembly, according to one or more embodiments described.

DETAILED DESCRIPTION

[0018] FIGS. 1 and 2 depict an illustrative packing tube isolation assembly 100, according to one or more embodiments. FIG. 1 shows the packing tube isolation assembly 100 in first or “open” position, and FIG. 2 shows the packing tube isolation assembly 100 in a second or “closed” position. In one or more embodiments, the packing tube isolation assembly 100 can include a first conduit or supply tube 110 in fluid communication with one or more second conduits or slave tubes 120. The first conduit 110 can be or include one or more tubular members or channels. For example, the first conduit 110 can be a transport tube that can be disposed within a wellbore as part of a shunt tube system, which is shown in FIGS. 3 and 4 and described below with reference thereto. The first conduit 110 can have one or more first flow paths 115 (one shown) to transport or channel a gravel slurry therethrough.

[0019] The second conduit 120 can also be or include one or more tubular members or channels defining a second flow path 125 therein. For example, the second conduit 120 can be a packaging tube connected to the first conduit 110. The second conduit 120 can also fluidly communicate with an annulus formed between the packing tube isolation assembly 100 and a wall of a wellbore, as shown in, and described below with reference to FIGS. 3 and 4.

[0020] The first flow path 115 can be in selective fluid communication with the second conduit 120. For example, the first conduit 110 can have one or more openings 112 formed therethrough, allowing the first and second conduits 110 and 120 to fluidly communicate. As used herein, the term “selective fluid communication” is generally defined to mean that a flow can be allowed or partially or completely blocked, obstructed, or otherwise attenuated as desired.

[0021] In one or more embodiments, the second conduit 120 can have a first portion 122 and a second portion 124 that can be welded, riveted, or otherwise fastened or affixed to the first conduit 110 around the opening 112. The first portion 122 can be disposed at an angle relative to a longitudinal axis of the first conduit 110, such that the first portion 122 of the second conduit 120 is not parallel to the first conduit 110, and at least a portion of the second portion 124 can be substantially parallel to the longitudinal axis of the first conduit 110. The angle of the first portion 122 can be, for example, any angle greater than 0 degrees, and can range from about 0.5 degrees to about 90 degrees, from about 20 degrees to about 70 degrees, or from about 30 degrees to about 60 degrees. The first and second portions 122 and 124 can be provided by a single tubular member that is, for example, bent, or can be two discrete tubular members fixed together at the desired angle, by welding or fastening, for example, using flanges, or the like.

[0022] One or more ports or outlets (three are shown 128A, 128B, and 128C) can be formed through the second portion 124 of the second conduit 120. The outlets 128A, 128B, 128C allow fluid communication between the first flow path 115 of the first conduit 110 and the second conduit 120 to an area external to the packing tube isolation assembly 100, as described below with reference to FIGS. 3 and 4. Although not shown, the outlets 128A, 128B, 128C can include one or more nozzles connected to or disposed within the second conduit 120.

[0023] The second conduit 120 can further include one or more chambers 140 disposed therein. The chamber 140 can be disposed within the second conduit 120, adjacent the first portion 122. The chamber 140 can be in fluid communication with the first flow path 115 and the first conduit 110 via a flow path or inlet 160. The chamber 140 can also be in fluid communication with the exterior of the packing tube isolation assembly 100, such as an annulus 148 of a wellbore, via a flow path or outlet 170, as shown in and described below with reference to FIGS. 3 and 4. The flow paths 160, 170 can be an aperture, channel, conduit, control line, or the like.

[0024] In one or more embodiments, a flow control device 165 can be located in the inlet 160 to allow selective communication between the chamber 140 and the first conduit 110. Illustrative flow control devices 165 can include rupture disks, pressure relief valves, or any other pressure sensitive devices. In another exemplary embodiment, the flow control device 165 can be a dissolvable plug or a solenoid. In another example, the flow control device 165 can be a pressure-sensitive device that is selectively actuable or opened by exposure to an activation level of pressure differential or another trigger, as described below.

[0025] A sealing member 150 can be at least partially disposed within the chamber 140. The sealing member 150 can be any slidable body or member that can move from a first or “open” position within the chamber 140, as depicted in FIG. 1, to a second or “closed” position within the chamber 140, as depicted in FIG. 2. When the sealing member 150 is in the first or “open” position (FIG. 1), the first flow path 115 can be in fluid communication with the second flow path 125. When the sealing member 150 is in the second or “closed” position (FIG. 2), the first flow path 115 can be prevented from communicating with the second flow path 125.

[0026] In at least one specific embodiment, the sealing member 150 can act as a piston that is moveable by applying a force against an upper surface thereof. As depicted in FIG. 1, the sealing member 150 can be substantially flat at an upper surface or first end thereof, and can be tapered or frustoconical at a second end thereof to correspond to the angled first portion 122 of the second conduit 120, among many other equally effective configurations are envisaged. As such, the sealing member 150 acts as a gate or switch to allow or block fluid flow through the opening 112, between the first flow path 115 and the second flow path 125.

[0027] In at least one specific embodiment, the sealing member 150 can be actuated by pressure within the first conduit 110. For example, when the second conduit 120 is packed or blocked, a pressure differential can form within the first conduit 110. The pressure within the first conduit 110 can rupture or otherwise cause the flow control device 165 to open, thereby placing the flow control device 165 in an open configuration. When the flow control device 165 is in an open configuration, pressure within the first conduit 110 can be communicated to the chamber 140, via the first inlet 160. When the sealing member 150 is axially moved, at least a portion of the sealing member 150 can extend past the chamber 140 and block the opening 112 to the second conduit 120. Accordingly, communication between flow paths 115, 125 can be blocked or prevented.

[0028] The outlet 170 can allow fluids such as air or liquids entrained within the chamber 140 to escape, i.e. vent, into the
annulus 148 of the wellbore or the flow path 125 when the sealing member 150 moves from the first position to the second position. Such communication can avoid or minimize back pressure that might otherwise impede the progression of the sealing member 150 from the first position to the second position.

[0029] In one or more embodiments, the sealing member 150 can be restrained in the first position by a restraining element 151. Illustrative restraining elements 151 can include shear pins or shear screws. Illustrative restraining elements 151 can also include an electrically-actuating element such as a solenoid, or a pneumatically- or hydraulically-actuating element, or the like. In operation, the restraining element 151 can receive a signal to be released, thereby releasing the sealing member 150 from its first position to the second position (FIG. 2). One or more control lines can be used to transmit a release signal to the restraining element 151. Illustrative control lines can include hydraulic control lines, pneumatic control lines, electronic control lines, or similar control lines. In one or more embodiments, wireless telemetry can be employed instead of, or in addition to, control lines.

[0030] FIG. 3 depicts an exemplary embodiment of a sand completion system 300, which integrates a plurality of the packing tube isolation assemblies 100, for example, a first packing tube assembly 100A and a second packing tube assembly 100B. It will be appreciated that various embodiments of the sand completion system 300 can include additional or fewer packing tube isolation assemblies 100, and may also include other packing tube isolation devices. The sand completion system 300 can be disposed in a wellbore 340, and can include one or more particulate control devices, for example, first and second particulate control devices 352, 354, and a tube 305. The first conduits 110 of the packing tube isolation assemblies 100A, B can be disposed substantially parallel to a longitudinal axis of the tube 305, such that, for example, in a vertical portion of the wellbore 340, the first conduits 110 are also vertically oriented. One or more packer assemblies (three are shown: 370, 380, 385) can be located around the completion system 300.

[0031] In one or more embodiments, the first and second particulate control devices 352, 354 can be sand control screens. For example, the first and second particulate control devices 352, 354 can be commercially-available screens, slotted or perforated screens, or screens packed with particulate material, or combinations thereof. The packer assemblies 370, 380, 385 can be one or more sealing members. For example, the packer assemblies 370, 380, 385 can include one or more packers capable of sealing off the annular region or annulus 364 between the completion system 300 and the wellbore 340. Illustrative packer assemblies 370, 380, 385 can include compression or cup packers, inflatable packers, swellable packers, "control-line bypass" packers, polished bore retrievable packers, other common downhole packers, or combinations thereof.

[0032] In exemplary operation, the completion system 300 can be conveyed into the wellbore 340, and can be used to perform downhole operations such as gravel packing. The wellbore 340 can have an open or cased borehole. When the wellbore 340 has a cased borehole, the wellbore 340 can have a casing 343. The wellbore 340 can have one or more hydrocarbon producing zones, for example, first and second hydrocarbon producing zones 342, 348.

[0033] The completion system 300 can be located within the wellbore 340, such that, in an exemplary embodiment, at least one packing tube isolation assembly 100 can be associated or placed adjacent each of potentially many identified hydrocarbon producing zones. For example, the first packing tube isolation assembly 100A can be located adjacent the first hydrocarbon producing zone 342, and the second packing tube isolation assembly 100B can be located adjacent the second hydrocarbon producing zone 348.

[0034] After locating the completion 300 within the wellbore 340, the packer assemblies 370, 380, 385 can be set. The packer assemblies 370, 380, 385 can define first and second wellbore regions 366, 368, by isolating the first and second hydrocarbon producing zones 342, 348 from one another. The packer assemblies 370, 380, 385 can be set by application of pressure, by application of axial force through the tube 305, by swelling, or in other ways known in the art.

[0035] In an exemplary embodiment, the packer assemblies 370, 380 can isolate the first hydrocarbon producing zone 342 and define the first wellbore region 366. The packer assemblies 380, 385 can similarly isolate the second hydrocarbon producing zone 348 and define the second wellbore region 368. Consequently, the first wellbore region 366 can be associated with the first hydrocarbon producing zone 342, and the second wellbore region 368 can be associated with the second hydrocarbon producing zone 348.

[0036] The first packing tube isolation assembly 100A can be deployed to the first wellbore region 366, and the second packing tube isolation assembly 100B can be deployed to the second wellbore region 368. The particulate control device 352 can also be deployed to the first wellbore region 366, and the particulate control device 354 can also be deployed to the second wellbore region 368. In one or more embodiments, the first conduit 110 of the first packing tube isolation assembly 100A can be configured to extend through the packer assemblies 370, 380 and can connect with the first conduit 110 of the second packing tube isolation assembly 100B. As such, the first conduits 110 of the adjacent packing tube isolation assemblies 100A, B can be in fluid communication with one another. Further, the packer assemblies 380, 385 can seal about the exterior of the portion of the first conduit 110 extending therethrough.

[0037] In an exemplary embodiment, after the packer assemblies 370, 380, 385 are set, gravel slurry 390 can be pumped or sent down the first conduit 110 of the first packing tube isolation assembly 100A. The gravel slurry 390 can flow from the first flow path 115 (FIGS. 1 and 2) of the first packing tube isolation assembly 100A through the second conduit 120 to the second flow path 125. The gravel slurry 390 can flow along the second flow path 125 to outlet 128, which can be outlets 128A, 128B, 128C (FIGS. 1-2), of the second conduit 120. The gravel slurry 390 can flow through the outlet 128 into the annular region 364 of the first wellbore region 366. The gravel slurry 390 can pack about the first particulate control device 352 as the fluid in the gravel slurry 390 migrates through the particulate control device 352. The fluid of the gravel slurry 390 that migrates through the particulate control device 352 can return to the surface, via the tube 305.

[0038] The gravel slurry 390 can be supplied to the annular region 364 of the first wellbore region 366, until the gravel slurry 390 at least partially covers or packs the outlet 128 and/or the second conduit 120 of the first packing tube isolation assembly 100A. A pressure differential can be created between the first conduit 110 of the first packer tube isolation assembly 100A and the first wellbore region 366 when at least
some of the outlets 128 (e.g., 128A, 128B, 128C of FIGS. 1-2) and/or the second conduit 120 are at least partially packed with gravel slurry 390.

With additional reference to FIGS. 1 and 2, in an exemplary embodiment, the flow control device 165 can be configured to rupture, open a pressure relief valve, shear frangible pins or screws, and/or otherwise communicate the chamber 140 with the first conduit 110 in response to the described pressure differential. For example, a desired activation level of the pressure differential can be predetermined, and the flow control device 165 can be configured to allow communication through the inlet 160 in response thereto. In an exemplary embodiment, the flow control device 165 can rupture, allowing a gravel slurry 390 and/or other fluid within the first conduit 110 to communicate with a space 145 in the chamber 140, via inlet 160, thereby applying the pressure differential across the sealing member 150. In another exemplary embodiment, after the pressure differential is recorded, for example, with a pressure transducer (not shown), a user or computer at the surface can transmit a control signal to the flow control device 165 via control lines or wireless telemetry. This can prompt the flow control device 165 to move into an open position, which can allow the communication of fluid therethrough and/or to release the sealing member 150 from the first position, if the sealing member 150 has been restrained therein.

The ingress of gravel slurry 390 or other fluids from the first conduit 110 into the space 145 can be propelled by the pressure differential between the first conduit 110 and the packed first wellbore region 366. The ingress of the gravel slurry 390 can propel, actuate, and/or slide the sealing member 150 from the first position to the second position as the gravel slurry 390 enters the chamber 140. In an exemplary embodiment, the sealing member 150 can also, or instead, be urged manually from the first position to the second position using a mechanical device (not shown). The sealing member 150 in the second position can block the second conduit 120 and isolating the flow paths 115, 125 from one another, as shown in FIG. 2. The isolation of the first and second flow paths 115, 125 of the first packing tube isolation assembly 100A from one another, can effectively prevent undesired fluid loss of the gravel slurry 390 through the flow path 125 as lower wellbore regions are gravel packed, and can prevent hydrocarbons produced in wellbore region 366 from entering the first conduit 110 of the first packing tube isolation assembly 100A.

After the sealing member 150 of the first packing tube isolation assembly 100A is actuated, the gravel slurry 390 can flow to lower wellbore regions, such as the second wellbore region 368, as shown in FIG. 4. FIG. 4, with continuing reference to FIG. 3, depicts the sand completion system 300, with the first wellbore region 366 having been gravel packed as described above, and the sealing member 150 effectively isolating the first and second flow paths 115, 125 of the first packing tube isolation assembly 100A from one another. Consequently, the flow of gravel slurry 390 can bypass the first wellbore region 366 and can flow to the first flow path 115 of the second packing tube isolation assembly 100B. The gravel slurry 390 can flow from the flow path 115 of the second packing tube isolation assembly 100B to the flow path 125 of the second packing tube isolation assembly 100B. Once the gravel slurry 390 gravel packs an annulus 365 of the second wellbore region 368, the sealing member 150 of the second packing tube isolation assembly 100B can block the continued flow of gravel slurry 390, in a similar operation as that just described with reference to the first packing tube isolation assembly 100A.

Gravel packing, as described for the first and second wellbore regions 366, 368, can be repeated for any additional wellbore regions of the wellbore 340. When gravel pack operations of one or more wellbore regions of the wellbore 340 are completed, production operations can be conducted. During production operations, hydrocarbons produced from each of the hydrocarbon producing zones 342, 348 (and any others) can be communicated to the surface via the tube 305. In one or more embodiments, the completion system 300 can be adapted to allow for selective simultaneous production of hydrocarbons from each hydrocarbon producing zone 342, 348 or hydrocarbons can be independently produced from one or more of the hydrocarbon producing zones 342, 348. For example, flow control devices (not shown) can be disposed about the tube 305 and can be selectively actuated to control the flow of hydrocarbons into the tube 305.

FIGS. 5 and 6 depict another embodiment of the packing tube isolation assembly 100. The packing tube isolation assembly 100 can be substantially similar to those described above with reference to, and shown in, FIGS. 1 and 2, and can include a flapper or reed 200 connected to or adjacent the chamber 140, such that the flapper 200 pivots from a first flapper position to a second flapper position. When the flapper 200 is in the first flapper position, the flapper 200 can be generally parallel to, and, in one or more embodiments, flush with the first portion 122 of the second conduit 120. In this position, the flapper 200 can cover at least a portion of the sealing member 150, thereby opposing the sealing member 150 moving out of the first or “open” position.

When the activation level of pressure differential is present or it is otherwise desired to move the sealing member 150 to the second position, as described above with reference to FIGS. 1 and 2, the sealing member 150 can push the flapper 200 into the second flapper position, as shown in FIG. 6. When the flapper 200 is in the second flapper position, the flapper 200 can extend at least partially through the first portion 122 of the second conduit 120, thereby allowing the sealing member 150 to, for example, descend partially out of the chamber 140 into the second conduit 120. In one or more embodiments, the flapper 200 can have a small cross-section relative to a cross-section of the first portion 122. Accordingly, when the flapper 200 is in the second flapper position, it can allow relatively free fluid communication between the second conduit 120 and the first conduit 110.

In one or more embodiments, the flapper 200 can be elastically deformed by the movement of the sealing member 150 to second position, such that the flapper 200 essentially fails and releases the sealing member 150. In one or more embodiments, the flapper 200 can be hinged and restrained in the first flapper position by any suitable device, such as a pin, solenoid and/or the like, and then released such that movement of the sealing member 150 to the second position releases the flapper 200.

In one or more embodiments, the sealing member 150 can be urged from the first position (FIG. 5) to the second position (FIG. 6) using a biasing member 202, which can be or include a spring or the like. In one or more embodiments, the biasing member 202 can be or include a leaf spring, compression spring, or any resilient member. The biasing member 202 can be restrained in a compressed state when the
sealing member 150 is in the first position. The biasing member 202 can thus supply a force to aid the movement of the sealing member 150 to the second position.

[0047] FIG. 7 depicts yet another illustrative packing tube isolation assembly 100, which can be substantially similar to any of the illustrative packing tube isolation assemblies 100 described above. In one or more embodiments, the packing tube isolation assembly 100 can include a magnetic actuator 250. The magnetic actuator 250 can be a passive fixed-pole magnet, such that the magnetic actuator 250 can supply a generally constant magnetic field to attract the sealing member 150, thereby aiding in drawing the sealing member 150 from the first position to the second position. In one or more embodiments, the magnetic actuator 250 can instead apply a repulsive force on the sealing member 150 to maintain the sealing member 150 in the first position. In one or more embodiments, the magnetic actuator 250 can additionally include or instead be an electromagnet which may be remotely-controlled via wired connections or wireless telemetry, for example, such that the magnetic actuator 250 can provide a magnetic field of selectable strength and direction to attract or repel the sealing member 150. Furthermore, the magnetic actuator 250 can be a solenoid that connects to the sealing member 150, or can be a disk or block magnet or the like.

[0048] Accordingly, in one or more embodiments, the amount of force required to move the sealing member 150 from the first position to the second position can be balanced between any combination of components that resist and those that assist the movement of the sealing member 150 from the first position to the second position. For example, the resistance of any combination of the restraining member 151 (FIG. 1), flapper 200 (FIG. 5), and/or the magnetic actuator 250 (FIG. 7), can be balanced with the urging of the biasing member 202 (FIG. 6), the magnetic actuator 250 (FIG. 7), and/or the pressure differential described above, until the force is sufficient to move the sealing member 150 to the second position.

[0049] As used herein, the terms “up” and “down”; “upper” and “lower”; “upwardly” and “downwardly”; “upstream” and “downstream”; and other like terms are merely used for convenience to describe spatial orientations or spatial relationships relative to one another in a vertical borehole. However, when applied to equipment and methods for use in deviated or horizontal boreholes, it is understood to those of ordinary skill in the art that such terms are intended to refer to a left to right, right to left, or other spatial relationship as appropriate.

[0050] Certain embodiments and features have been described using a set of numerical upper limits and a set of numerical lower limits. It should be appreciated that ranges from any lower limit to any upper limit are contemplated unless otherwise indicated. Certain lower limits, upper limits and ranges appear in one or more claims below. All numerical values are “about” or “approximately” the indicated value, and take into account experimental error and variations that would be expected by a person having ordinary skill in the art.

[0051] Various terms have been defined above. To the extent a term used in a claim is not defined above, it should be given the broadest definition persons in the pertinent art have given that term as reflected in at least one printed publication or issued patent. Furthermore, all patents, test procedures, and other documents cited in this application are fully incorporated by reference to the extent such disclosure is not inconsistent with this application and for all jurisdictions in which such incorporation is permitted.

[0052] While the foregoing is directed to embodiments of the present invention, other and further embodiments of the invention may be devised without departing from the basic scope thereof, and the scope thereof is determined by the claims that follow.

What is claimed is:

1. A packing tube isolation assembly, comprising: a first conduit extending substantially parallel to a longitudinal axis of a tube disposed in a wellbore and having an opening defined in the first conduit; a second conduit fluidly connected to an annulus of the wellbore and to the opening of the first conduit; and a sealing member disposed adjacent the second conduit and configured to substantially obstruct the second conduit when the second conduit is at least partially packed with a gravel slurry.

2. The packing tube isolation assembly of claim 1, wherein the sealing member is movable from a first position where sealing member allows fluid communication through the second conduit, to a second position where the sealing member blocks fluid communication through the second conduit.

3. The packing tube isolation assembly of claim 2, wherein the sealing member comprises a slideable member configured to increasingly extend out of the housing and into the second conduit as the sealing member moves toward the second position.

4. The packing tube isolation assembly of claim 2, further comprising a restraining element, wherein the restraining element locks the sealing member in at least one of the first and second positions.

5. The packing tube isolation assembly of claim 2, further comprising a flapper having a first flapper position in which at least a portion of the flapper is substantially parallel to the second conduit and opposes the sealing member from moving to the second position, and a second position in which the flapper extends at least partially through the second conduit.

6. The packing tube isolation assembly of claim 2, further comprising a housing at least partially containing the sealing member in the first position and including:
an inlet in fluid communication with the first conduit and an interior of the housing; and
an outlet in fluid communication with the interior of the housing and the annulus of the wellbore, and disposed on an opposite side of the sealing member from the inlet.

7. The packing tube isolation assembly of claim 6, further comprising a flow control device disposed in the inlet and configured to block fluid communication through the inlet until a pressure differential between the first conduit and the annulus of the wellbore reaches an activation level.

8. The packing tube isolation assembly of claim 7, wherein the flow control device comprises at least one of a rupture disk and a pressure relief valve.

9. A system for gravel packing a well, comprising: a tube at least partially disposed in the well; and first and second packing tube isolation assemblies disposed around the tube, each comprising:
a first conduit having an opening formed through a wall thereof;
10. The system of claim 9, wherein the sealing member comprises a sliding sleeve, a flapper valve, a check valve, or a combination thereof.

11. The system of claim 9, further comprising a housing connected with the second conduit and at least partially containing the sealing member.

12. The system of claim 11, wherein the housing comprises an inlet in fluid communication with the first conduit and a first space defined between the sealing member and the housing, and an outlet in fluid communication with the well and a second space formed between the sealing member and the housing.

13. The system of claim 12, wherein a flow control device is disposed at least partially in the inlet.

14. The system of claim 13, wherein the flow control device comprises a rupture disk configured to rupture when the pressure differential reaches the activation level, such that fluid communication through the inlet moves the sealing member.

15. The system of claim 13, wherein the flow control device comprises a pressure relief valve configured to open when the pressure differential reaches the activation level, such that fluid communication through the inlet moves the sealing member.

16. A method of isolating a packing tube, comprising: supplying a gravel slurry through a first conduit; channeling at least a portion of the gravel slurry from the first conduit to a second conduit; distributing the gravel slurry to a portion of an annulus of a wellbore through one or more outlets defined in the second conduit; actuating a sealing member connected to the second conduit when the second conduit is at least partially packed with gravel slurry; and isolating at least a portion of the second conduit from the first conduit with the sealing member.

17. The method of claim 16, wherein actuating the sealing member comprises actuating a flow control device positioned between the first conduit and the sealing device with a pressure differential between the portion of the annulus of the wellbore and the first conduit to place the first conduit in fluid communication with the sealing member.

18. The method of claim 17, wherein actuating the sealing member further comprises: sliding the sealing member from inside a housing into the second conduit; and blocking the second conduit with the sealing member.

19. The method of claim 18, wherein actuating the flow control device comprises opening a pressure relief valve or rupturing a disk in the flow control device.

20. The method of claim 17, wherein actuating the sealing member comprises sliding the sealing member into the second conduit to block the second conduit by applying the pressure differential across the sealing member.

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