A NEW AGE OF DIGITALIZATION IN OIL AND GAS INDUSTRY:A REVIEW

Er. Amandeep[1], Mr. Akhilesh Kandwal[2], Er. Niharika Mishra[3], Er. Pooja Arya[4]

[1]*Assistant Professor, Petroleum Engineering, Roorkee College Of Engineering, U.K., India*
[2]*Assistant Professor, Mechanical Engineering, Roorkee College Of Engineering, U.K., India*
[3]*Assistant Professor, Petroleum Engineering, Roorkee College Of Engineering, U.K., India*
[4]*Assistant Professor, Mechanical Engineering, Roorkee College Of Engineering, U.K., India*

ABSTRACT

The oil and gas industry is inaccurately isolated into three pieces. The upstream area finds and recovers foul oil and vaporous oil; this consolidates anything from seismic examination to well fulfillments. The midstream divide deals with the vehicle of those things after recovery to planning, scattering, or limit. The downstream segment refines and scatters oil and gas things to end customers. Mechanical self-rule and computerization have made advances into all of these sections in moving degrees. This part will research the introduction and mix of these progressions into the upstream and midstream organizations.The oil and gas industry will continue impacting in the coming future. Getting oil and gas from customary and non-normal resources will end up being progressively trying. This reinforcing need will drive genuinely broad demands on work power, financial and development capacities. Since the future supplies of oil and gas are to broaden, pattern setting advancement will end up being logically essential to gain access to all the all the more testing normal and non-standard resources. Thusly oil and gas headways will be over the top to work in the coming future due to adversarial, hard to-land at circumstances. The toward the ocean oil industry will transform into a confounded countless bleeding edge rigging, structures, and work power. The present work perceive potential applications and research headings of mechanical innovation in the oil and gas field and examine the deterrents and troubles of apply self-governance applications to this locale. This assessment plays out the basic survey and assessment about the work conditions of mechanical innovation and its apparatus in the oil and gas industry, especially offshore oil rigs. The oil and gas industry structures are first investigated. The personals and assignments are then examined. Besides, this paper reviews the present mechanical innovation development applied to various oil and gas undertakings. The troubles and necessities are recognized for mechanical innovation in the oil and gas industry. The necessities of mechanical innovation and robotization in the oil and gas industry are presented.

Keyword: - *Robotics, Detection And Inspection, Automation, And Modernization Of Oil And Gas Technology etc….*

AGE OF DIGITALIZATION

In standard society, the articulation "robot" calls pictures of normally noxious anthropomorphic frameworks from science fiction. The term is truly gotten from "robota," the Czech word for work, organized in 1921 by the kin of Czech creator Karel Capek to delineate the characters of a play entitled "Rossum's Universal Robots." The play's rule characters are a disillusioned assembling of planned mechanical production system workers. In the mechanical world, the term robot is dynamically unremarkable and has come to depict a combination of devices guided by means of customized or self-deciding control that perform com-plicated, every now and again dreary assignments rather than human experts considering threats or site receptiveness. The fundamental present day robot was assigned "Animate", Unimate robots are still being used today. From this first fruitful establishment, robots have been conveyed for everything from bomb removal to human surgeries. The midstream oil and gas segment is the hand-off point for the upstream area's items. Midstream forms usually allude to handling, transport, and capacity of these items since it is conceivable to create pipeline quality gas for direct deal to an interstate or intrastate gaseous petrol pipeline in the midstream area, some treatment or handling of petroleum gas may happen in the midstream part and sidestep the downstream oil and gas division totally. The midstream commonly interfaces the stock of the oil business to the interest for vitality products The downstream business contacts buyers through a large number of

items. This paper gives a fundamental information based to use in understanding the earth in which seaward modern apply autonomy would work, just as spread the difficulties that exist inside that condition of such ventures. The procedures depicted here relate basically to the upstream oil and gas segment, as that specific division has most of chances for apply autonomy and computerization. The oil and gas forms and the three division model they fall into will in general equal over the inland and seaward ventures, anyway the procedures will be recognized when important if a particular perception is being made. The significant oil and gas extraction forms incorporate the materials and gear utilized and the procedures utilized.

There are four significant procedures in the oil and gas extraction industry :

(1) Survey and Exploration,

(2) Pay Zone improvement

(3) Getting Higher Yield

(4) Site deserting

After these procedures are finished, the creation procedure enters. It is likely the procedure where apply autonomy and computerization have the biggest potential to build proficiency and make a more secure condition for seaward oil and gas fixes, all while cutting development costs for human required apparatus structures with respect to investigation and support of hardware. This is one zone of activity that apply autonomy and robotization can drastically improve effectiveness, exactness, wellbeing, and reduction expenses to organizations. It is no inspire bigger thoughts to recommend that robots and robotization will before long be the essential way to viably fulfill.

1. IN MIDSTREAM

In midstream oil and gas tasks, the framework is regularly progressively open, and the conditions can be less extreme. Along these lines, robotization arrangements have made more noteworthy advances. Starting at the wellhead, various associations offer autonomous data verifying and transmission structures that read commitment from well checks and transmit data remotely for review. These transmissions frameworks might be a piece of a whole field arrange that can permit restricted changes in accordance with be made to the field execution remotely. Pipelines likewise advantage from their relative openness and nearly less unfriendly conditions, since it is presently conceivable to send fastened or self-ruling examination gadgets called savvy pigs inside pipelines to perform assessments. These gadgets can gauge and record divider thickness and ID profile, and permit administrators to make expectations about consumption or disintegration rate, and decide when to perform upkeep. Automated brilliant pigs alongside scientific programming are the crucial instruments of pipeline honesty the executives (PIM) programs. These PIM programs expect to supplant responsive hole fixes and different disappointments with proactive, prescient maintenance that, for instance, fixes issues that can prompt breaks before the holes happen. The linkage portrayed beneath is a pipeline examination robot offered by Baker Hughes. Oil transport and capacity gear, for example, tankers additionally utilize automated gadgets for investigation. Fastened robots are utilized both inside the holds of oil tanks and on the outside bodies of the vessels to search for harm or holes. Offered by a few producers, these gadgets can execute a pre-set examination way or be guided remotely.

2. RO B O T I C S IN ONSHORE CONDITIONS

Oil and gas industry has broad utilization of a wide range of channels and capacity tanks during various phases of business beginning from investigation, extraction, transportation, preparing furthermore, dispersion. P ipes and capacity tanks need normal investigation furthermore, support particularly those consistently utilized for long separation transportation and long haul stockpiling. Humanly examining these parts are costly and dangerous, so mechanized examination and control for these parts are especially wanted. The majority of the mechanical research, for oil also, gas industry, has been committed to creating in-pipe assessment robots (IPIRs) and tanks review robots (TIRs).

3.   CHANNEL INVESTIGATION

At coastal oil plants, pipes are utilized as a device for transportation of oil, gas and different liquids, from creation destinations to appropriation locales. These funnels are for the most part set down under water or underground condition. In such situations pipes are exposed to outrageous climate conditions, for example, hot, cold, moistness and residue. These ominous conditions lead to numerous inconveniences in funnels, for example, consumption, disintegration, statement, splits, warm cycling, pitting, stun stacking and joint-disappointment and so forth. Any sort of spillage of oil based goods from pipes not just purposes loss of income yet additionally welcomes biological fiasco. Subsequently, ordinary assessment and support of transportation pipes are unequivocally requested for safe activity. Customary method for burrowing and physically recognizing the worldly position of these blemishes for underground funnels are not just awkward yet in addition costly. IPIRs outfitted with nondestructive testing (NDT) of these blemishes holds the key for future improvement in this field . These IPIRs are embedded in the funnel from a channel point and travel inside the funnel under outer supervision. There are different causes and sorts of blemishes, and for them there are proper examination methods, for example, visual assessment (HD container tilt-zoom cameras), X-beam, whirlpool flows, acoustics and ultrasonic. The greater part of the IPIRs is tele operated also, associated by fastened link to the administrator. There are five fundamental parameters to classify IP IR:

There are channels of different shapes (straight line, elbow-shape and T-shape and so on.) and sizes (various radii) engaged with the oil and gas businesses agreeing to utilization and stream conditions. Along these lines, shape and size of pipes are one of the significant parameter to influence the structure of IPIR for instance miniaturized scale robots are required for littler size funnels. There are principally two kind of system for adjustment of shifting radii of the channels specifically dynamic linkage type and inactive linkage type. In dynamic linkage type, separate actuators are introduced to apply ordinary power to produce required footing power. In this manner, this system requires more space and costly from assembling perspective. While, latent linkage component is planned just with flexible segments, for example, spring. This course of action prompts effortlessness of control system and cheap assembling of robot. Examination robots depicted in have utilized straightforward spring on the principle pivot of robot.

Most of the robots are structured to go through flat funnel structures however urban gas pipe lines have muddled structures because of complex circulation systems. In this way, effective route through these transportation pipes requires in-pipe robots to guide through complex shapes, for example, vertical, elbow and spread. There are essentially two classifications of directing system right off the bat enunciated type and also differential sort. Verbalized directing is a component which permits a robot to take turn in confined space around a rotate situated on the robot body by parting the complete body of the robot in front half and back half. This sort of guiding instrument is legitimately propelled by development of the snake and the annelid creature in nature. There are a few sorts of enunciated directing instruments depending on how guiding is initiated around the rotate point, for example, guiding joint, two fold dynamic widespread joint, and elastic gas incited joint. There are a few fruitful IPIRs dependent on the differential directing system also. Differential drive is an instrument which permits turning of the vehicle by balancing the rates of the wheels relying upon the ideal bearing for turning. Since, inside the channel footing surface is 3-D bended instead of planer, subsequently it requires refined speed control

Component to maintain a strategic distance from slipping of wheels inside the funnel. These necessities for information on the funnel geometry and locus of contact focuses make this component muddled issue of control. Every IPIR must have a few impelling component to explore inside the channel separated from guiding component. There are various sorts of route innovations utilized by in-pipe robots relying upon the necessities of the activities, for example, P ig type Wheel type Snake type Legged portable sort or Walking type, Caterpillar type -press type, Inch-worm typeand Screw type and so on. Most of the distributed research works about IPIRs are concerned with in-pipe route of robots in light of the fact that with expanding multifaceted nature of the channels, route becomes testing task. The pig type robot is assortment of container type metallic body, elastic circle for help from pipe dividers, ultra-sonic transducers for discovery, and odometer for separation computations. Elastic circle get support from the divider as well as likewise obstructs the in-pipe liquid to get latently determined by it.

Disadvantage of this instrument is that, robot continues pivoting around its focal pivot. P assively determined in-pipe robots perform poor on different events, for example, when liquid weight inside pipes are low and transportation pipes have complex shapes (Extended and vertical). Wheel type IPIRs are proposed to beat these deficiencies. Wheel based robots have numerous points of interest, for example, simple speed, course control and higher vitality proficiency yet experience the ill effects of complex directing instrument and insecurity during route.

To conquer this unsteadiness, springs are utilized to press the in-pipe dividers against wheels of the robot. This squeezing of dividers gives extra erosion power for better slip-less activity and versatility of robot to various sizes of transportation pipes. Portrays a system in which legs of the robot, which contains wheels, are extended and contracted radially to create divider pressure. This weight gives all the previously mentioned advantages and

Spares collection of robot from bending powers when it crosses over impediments, for example, steps, reducers, and projections inside the pipes. It tends to be seen that the greater part of these wheel based examination robots create footing power by squeezing the channel divider inactively or effectively. These wheel based robots stall out

Inside the channel when there are sharp comers, steps, unexpected enormous change in pipe cross-segment and variable surface harshness. As a choice to wheel based movement, legged sort robots have been proposed in [53]. The higher adaptability of legs, improves the presentation of robot crossing the impediments and pivoting joints and comers [56]. Structure of IPIRs for the assessment of channels of little breadths by utilizing wheel based motion system is actually a challenge. Wheel based robots require overwhelming engines and rigging frameworks, and utilization of other sort of actuators, for example, piezoactuators experience the ill effects of lower footing powers [69]. Along these lines, two headway instruments liberated from electrical machines are proposed right off the bat inch-worm type robots and furthermore screw type robots, for investigation of little measurement pipes. Night crawler is an animal which pushes ahead by expanding its realrings and afterward engendering it forward way. This Motion instrument has propelled specialists to structure inchworm robots, which don't require massive and expensive electrical engines and wheels. Aside from being less expensive and lighter in weight nonattendance of electrical machines makes inch-worm robots more secure and reasonable for working in blast chance zones.

These robots have adaptable structure which is partitioned for the most part in three sections in reverse clasp, center part and advance brace. First in reverse part extend radially to produce support from the divider, while center part get extended longitudinally to push ahead and afterward in reverse brace get contracted and forward brace get extended radially to produce support. In any case, a significant number of these inch-worm robots, for example,
 were not powerful due to their low speed and poor unwavering quality. Screw-type robots can unreservedly go in reverse and forward, inside the funnel of littler breadth, in light of the rule of screw. has proposed a robot which has two units, isolated by a miniaturized scale electromagnetic engine, and one unit is fixed to pivoting shaft and another to packaging. This course of action powers shaft and packaging to pivot in inverse course with the goal that robot pushes ahead. This sort of robot is mostly utilized for exact movement inside littler breadth pipes with extremely low payload and unsatisfactory for complex channel structures. Adaptability of the robot body is a key factor for

its capacity to go through complex states of funnels. Numerous robots utilizing adaptability of snake kind body has been proposed in writing.The snake type robots are planned by sequential interconnection of numerous indistinguishable modules on both sides with rotational joints. Robot can move on a level plane a lot like ordinary wheel based movement. Though, vertical movement is accomplished by utilizing adaptability of pushing interconnected joints against the two rival side of the funnel simultaneously, while moving upward by forward movement of wheels. Since, snake-like robots utilize various dynamic joints or modules; consequently, their improvement cost is costly and they need more vitality for activity

4. DETECTION INNOVATION

 These in-pipe robots are prepared with different tangible gadgets each identified with explicit sort of work. Visual cameras, for example, CCD miniaturized scale CCD CMOS and miniaturized scale CMOS cameras are utilized with the end goal of route and review. CMOS cameras require lesser parts than CCD, which makes them relatively more vitality effective and less expensive than CCD. Since, CCD cameras for the most part will in general have higher goals than CMOS, accordingly decision of camera requires exchange off among cost and clearness of picture. The majority of the financially accessible CCD cameras are exceptionally huge and can't be legitimately introduced on the miniaturized scale robots. Along these lines have built up their own particular smaller scale CCD cameras appropriate for investigation of little measurement pipes. Miniaturized scale CCD camera created in conveys 41K shading pixels and with this goals it can find smaller scale splits in the inward surface of the channel.

One of the serious issues for the channels in oil and gas industry is erosion because of undesirable electro-substance responses. Job of NDT gets basic to recognize beginning times of consumption with the goal that restorative measures can be taken previously serious harm happens. Beginning times of erosion are most certainly not legitimately unmistakable or noticeable by conventional surface estimation strategies. In any case, early discovery of consumption is conceivable by estimation of avoiding pipe divider thickness and auxiliary discontinuities. At present there are serval advance strategies accessible for erosion location, for example, X-Ray, ultrasonic

and attractive motion spillage (MFL). X-beam based identification systems appreciate edge over other NDT of its

being fit for pictorial portrayal. There are numerous other points of interest of X-beam NDT, for example, capacity to recognize material, evaluating material thickness, and equipped for assessing nearly a wide range of materials, however experiences necessity of gifted analyzer, costly, failure to identify shut breaks or more of all wellbeing concerns identified with its activity. At the point when attractive field is applied to the inward mass of the pipe lopsided surface of erosion influenced divider contorts the coming about attractive field. These contortions in attractive field are estimated by attractive sensors yet in general estimation result is just subjective in nature. This attractive transition spillage (MFL) method is appropriate for little funnels, and now and again when pipe materials have polluting influences consequences of MFL are deceptive in nature. There are two sorts of MLF strategies initially circumferential and furthermore pivotal. Circumferential MLF is more well known and powerful than pivotal one. MLF system is touchy to pipe material under review while ultrasonic is liberated from this defect and increasingly exact in forecasts. In ultrasonic discovery strategy, high recurrence acoustic waves are transmitted from transducers, which are reflected by inside and outside surfaces of the funnel. Estimations over reflected and refracted-reflected waves permits estimation of outer and inner consumption. Ultrasonic discovery procedure has numerous preferences, for example, high entrance profundity, high precision, high affectability, quick testing, versatile, safe and at long last it can test a wide range of materials and their properties, yet experience the ill effects of costly preparing for master administrator, need of contact of transducer with surface of material and failure to recognize split along the line of wave travel. Quantitative variety of impendence test of loop due to vortex current on pipe surface prompts recognition of break in the funnel. Remote field swirl current (RFEC) based NDT is another variety of previously mentioned ordinary swirl current testing (ECT) procedure. The vast majority of the consumption location systems comes up short at high temperature, for example, 175°C inside more profound center of the earth, so has proposed another DC electromagnetic enlistment utilizing ECT strategy. ECT systems are delicate to enormous number of parameters identified with attractive conductivity, porousness, and geometry. It has numerous different favorable circumstances, for example, more extensive temperature run for activity, littler sizes for tests to be used for littler distance across pipes, light weight and compact to be introduced on small scale robots, and moderately lower in cost,

Tank review Immense metallic tanks are utilized for putting away the petro-synthetic items both at seaward and inland creation plants Ceaseless stockpiling of unrefined oil based commodities inside the metallic tanks creates numerous destructive results, for example, iron sulfide and hydrogen sulfide. These tanks have numerous welded joints and these are inclined to spillage because of consumption what's more, wear. Percolating H2S harms the rooftop than the base of the tank. Base of the tank is for the most part harmed by assortment of enormous amounts of ooze material containing heterotrophic microorganisms. Albeit base likewise contains numerous consumption pits made because of inner responses of petroproducts. Since, humanly investigation of these tanks, is risky because of quality of H2S and such different gases, requires totally exhausting the tank and halting all the creation for scarcely any weeks, consequently, this procedure is extensive, costly and dangerous from security perspective. Robotized examination, while tanks are full, with proceeded with activity of the plant is the inspiration for investigate for TIRs. Principle criteria of sorting the TIR, depends on the guideline of climbing the tank under investigation. There are two general classes of climbing procedures, right off the bat dependent on grip system and furthermore on the headway standard. The most widely recognized attachment instruments are attraction, vacuum suction, explicit connection gadgets, for example, rails or pegs and grippers/braces. The velocity class can be additionally partitioned in four sub-bunches, for example, wheels, tracks, leg and actuator based gadgets.There are some exceptional tank assessment robots, for example, Neptune, Maverick and Scavenger. Neptune is a portable robot planned by Robotics Institute at Carnegie Mellon University. This robot focuses on remote assessment of over the ground tanks, while they are loaded up with oil based goods. Neptune is furnished with vehicle crawler to go up and inside the tank, ultrasonic sensors for distinguishing spillage, HD cameras for visual input and acoustic sensors for position locationing inside the tank and so forth. Neptune gives the visual records of each welded joint and thickness-form maps for the floor of the tank utilizing ultrasonic thickness estimation sensors. Since, the majority of the TIRs convey practically comparable sorts of gear with the end goal of assessment as IPIRs yet their primary contrasts originate from climbing advances. In this way, in more extensive sense dialogs identified with identification innovations and control instruments portrayed are very well appropriate to the robots of TIR classes also. There are additionally some novel control components proposed for TIRs as in and has displayed a fluffy CMAC calculation alongside neural systems to set up the following control framework for improving the exhibition of the robot route. In [135] a novel customer/server engineering has been proposed for independent activity of the review robot. Here customer program is run on the investigation root locally which is identified with safe climbing and route of robot, while server program is run on administrator side at control room. At server side, programs are worried about catching the visual information, identification of spillage and some control work. Fuel tanks introduced on the ship

have dainty metallic dividers so typically utilized overwhelming climbing robot can't be utilized due to propensity of twisting of surface. A tale design called mother/kid has been proposed in, to manage such a circumstance. Where mother robot is typical an overwhelming climbing robot with high portability utilized for moving through solid track accessible on the tank. What's more, youngster robot, which is extremely light in weight, conveys just required locators for review. The vast majority of these robots are at max semi-self-governing in nature however gives completely self-governing TIR remote control.

5. CONCLUSIONS

In this paper, a short prologue to the oil and gas industry forms is performed. The difficulties and prerequisites for the apply autonomy are investigated. Future research openings including robot controller, versatile stage, teleoperation, and subsea apply autonomy are talked about. By and large, one can expect that there are numerous open doors in the oil and gas industry and some exploration is as of now in progress to create mechanical and robotization applications. herefore, it is an ideal time to create mechanical and mechanization frameworks that can fulfill the oil and gas prerequisites. There is little uncertainty that the oil and gas organizations would profit significantly from the utilization of increasingly smart advances, expanding their proficiency, yet additionally eliminating human hazard factors that are ever present in rig conditions. There is a reasonable motivating force for oil and gas organizations to computerize their oil and gas offices, beginning with secluded tasks, for example, pipe taking care of and get together for boring and assignments identified with rig activities. These models speak to high-chance activities for people and in this way give chances to improve wellbeing, security and natural execution. Notwithstanding profitability and productivity gains, robots utilized for high-hazard errands will likewise prompt enhancements in wellbeing, security and ecological execution. Such errands are not really constantly unsurprising and speak to strange robot exercises. The robot will in this way require highlights that expand the "eyes, ears, and hands" of the human leaders as they complete examinations and upkeep tasks on the procedure framework. Decreased authorizing and activity costs, together with improved Environmental, Health and Safety (EHS) are a portion of the potential advantages of having regularly unmanned topside oil stages. Notwithstanding, such oil and gas stages require propelled techniques and instruments for remote control and checking of investigation and upkeep activities.

This paper outlines the condition of craftsmanship mechanical arrangements accessible for in-pipe examination and tank investigation robots at coastal offices of oil and gas industry. This paper has too outlined different directing instruments, impetus advances, imperfection identification strategies and control systems for these examination robots. The majority of the financially accessible robots, utilized for pipe examination and tank investigation, are remotely worked machines with almost no self-sufficiency. Yet, patterns of fruitful execution of solid semi-independent what's more, teleoperated robots are fantastic decisions as not so distant future arrangements. Advancement of barely any totally self-governing robots, from different fields, for example, water pipe examination, is exceptionally promising for future completely computerized robots for oil and gas plants.

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