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DENSITY-BASED CRUDE OIL-WATER SEPARATION SYSTEM

King Fahd University of Petroleum and Minerals
 Capstone 2.0
 Term: 231

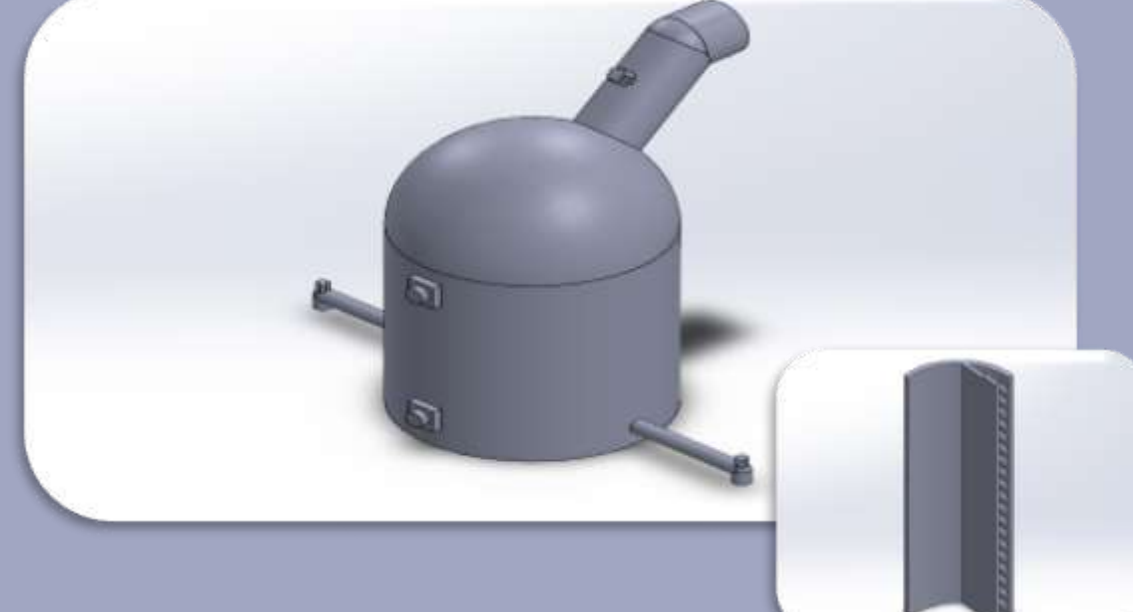


CONCEPTUAL DESIGNS

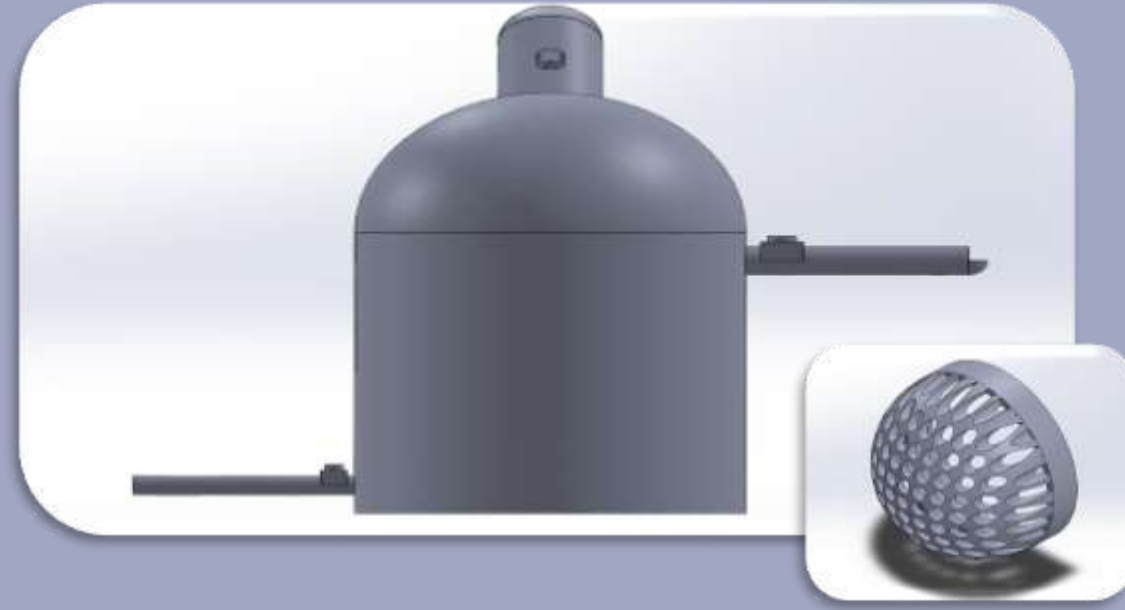
DESIGNS: #1



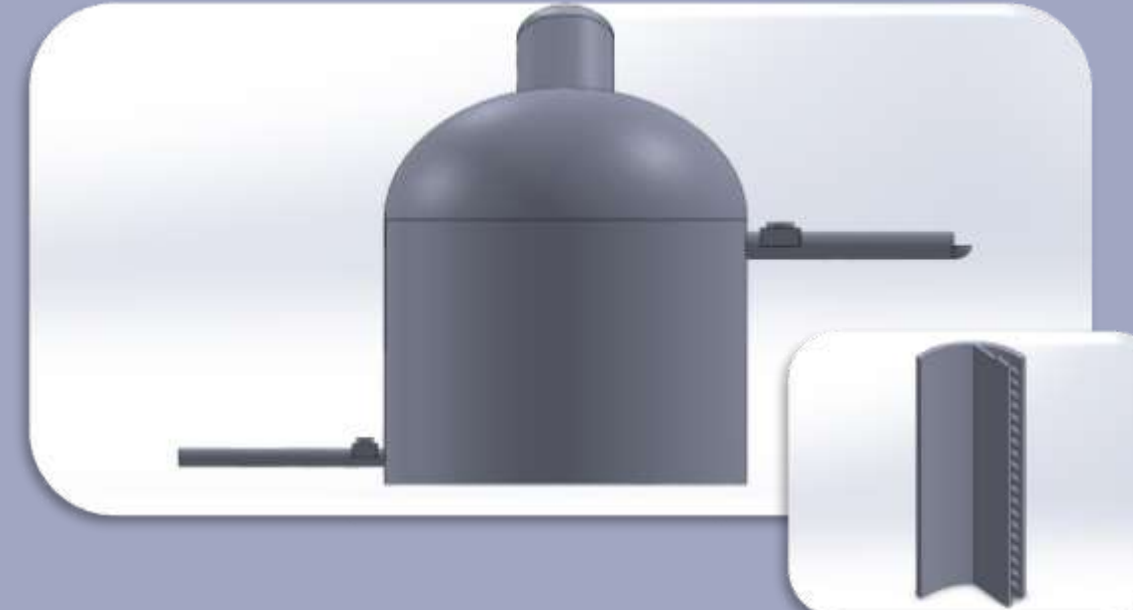
DESIGNS: #2



DESIGNS: #3



DESIGNS: #4



EVALUATION OF CONCEPTUAL DESIGNS

DESCRIPTION	DESIGN #1	DESIGN #2	DESIGN #3	DESIGN #4
Accuracy		+	-	+
Time efficient	Reference	+	++	++
Manufacturing		-	0	-
Reliability		+	++	++
Total		3	4	5

BACKGROUND

INTRODUCTION:

OUR SENIOR ENGINEERING TEAM IS LEADING AN INNOVATIVE PROJECT AIMED AT REVOLUTIONIZING CRUDE OIL-WATER SEPARATION WITHIN THE OIL AND GAS INDUSTRY. THROUGH THE DEVELOPMENT OF A COMPREHENSIVE SYSTEM THAT LEVERAGES DENSITY DIFFERENCES BETWEEN CRUDE OIL AND WATER, WE ARE POISED TO ACHIEVE UNPRECEDENTED LEVELS OF EFFICIENCY AND EFFECTIVENESS IN SEPARATION PROCESSES.

PROBLEM STATEMENT:

OUR SPECIFIC PROBLEM STATEMENT IS TO DEVELOP A SYSTEM THAT EFFICIENTLY SEPARATES CRUDE OIL FROM WATER, MINIMIZING WATER CONTENT IN THE EXTRACTED OIL.

CONSTRAINTS:

TIME CONSTRAINTS – REGULATORY COMPLIANCE – SPACE LIMITATION – SAFETY PROTOCOLS – CLIENT EXPECTATIONS – SCALABILITY REQUIREMENTS

TARGET SPECIFICATIONS:

OIL-WATER SEPARATION EFFICIENCY 90% - OPTIMAL FLOW RATE 3GM - VALVE CONTROL ACCURACY 95% – COST EFFECTIVENESS 3102 SAR – AUTOMATION AND RELIABILITY 95%

PROTOTYPE TESTING

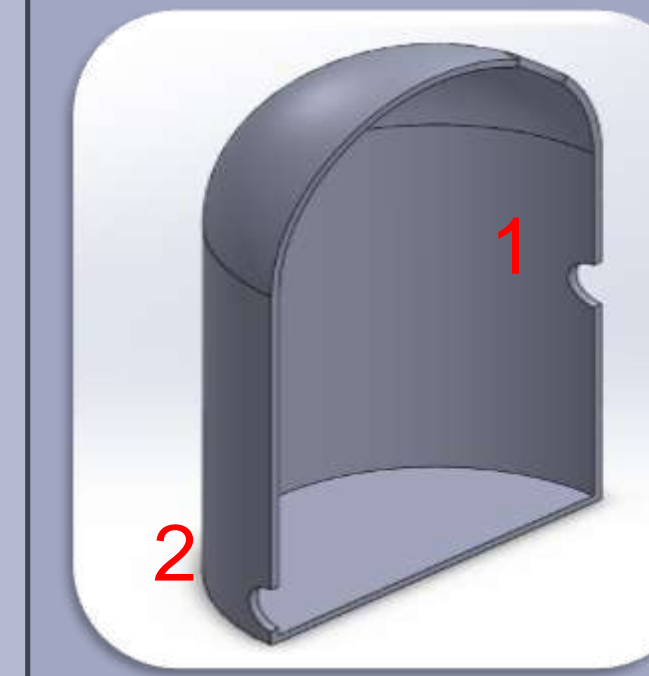
FROM BERNOULLI'S EQUATION WE WANT TO FIND THE PRESSURE AT 1 AND 2:

AT 1:

$$P_1 = g\rho_{oil}h_{1,out}$$

AT 2:

$$P_2 = P_1 + g\rho_w(h_{2,out} - h_{1,out})$$



NOTE THAT ρ_{oil} AND ρ_w ARE VARYING WITH RESPECT TO TIME. TO SOLVE THIS ISSUE, WE CAN FIND THE INTEGRATION OF THESE TWO VARIABLES WITH RESPECT TO TIME, OR WE CAN USE A PREVIOUS DATA AND MAKE THE DENSITIES AS A RANGE.

$$\rho_{oil} = (700 - 950) \text{ kg/m}^3$$

$$\rho_w = (980 - 1030) \text{ kg/m}^3$$

CONCLUSION

IN SUMMARY, OUR PROJECT REPRESENTS A PIONEERING ENDEAVOUR IN OPTIMIZING CRUDE OIL-WATER SEPARATION. THROUGH METICULOUS FLOW OPTIMIZATION, REAL-TIME DENSITY MONITORING, AND PRECISE VALVE CONTROL, WE ARE COMMITTED TO ACHIEVING EXCEPTIONAL SEPARATION EFFICIENCY AND HIGH-QUALITY OIL PRODUCTS WITH REDUCED WATER CONTENT. THIS PROJECT HAS THE POTENTIAL TO BRING SIGNIFICANT BENEFITS TO THE OIL AND GAS INDUSTRY, DRIVING OPERATIONAL EFFICIENCY AND PROMOTING ENVIRONMENTAL SUSTAINABILITY.

