

SUMMER INTERNSHIP RESEARCH WORK REPORT

ON THE TOPIC
TRANSPARENT INJECTOR VISUALISATION AND SETTING UP OF DROPLET BREAKUP RIG

UNDER THE GUIDENCE OF
DR. PANKAJ KOLHE SIR

SUBMITTED BY
NAME :-BHASKAR ANAND
BRANCH :-MECHANICAL ENGINEERING
COLLEGE :-BIRLA INSTITUTE OF TECHNOLOGY, MESRA ,JHARKAND

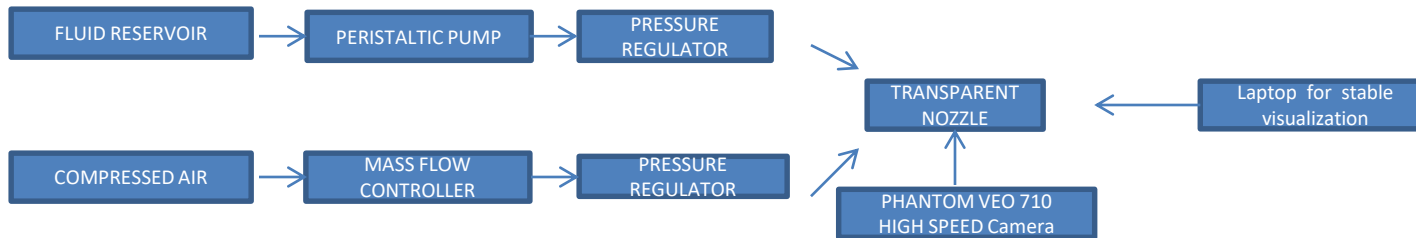
INTRODUCTION

- The purpose of this study is to understand the concept of primary and secondary atomization of twin fluid Flow blurring transparent injector and to visualize various breakup regimes with the help of two separate experimental setups.
- **TRANSPARENT INJECTOR VISUALISATION**

Our experimental Layout for Transparent injector visualization is shown in Figure 1.

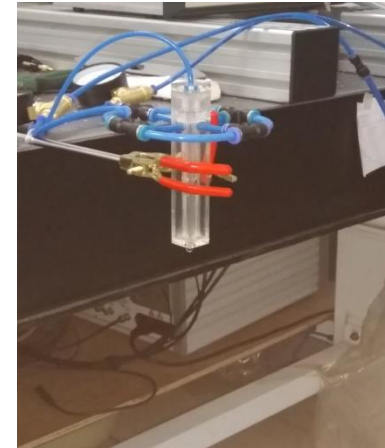
WORKING PRINCIPLE:- An aerodynamic two-phase flow is created at the end of the inside liquid supply tube because of the surrounding air back flow penetrating into the liquid tube tip and bubbling into the liquid stream

FIGURE 1:- EXPERIMENTAL LAYOUT SETUP FOR TRANSPARENT INJECTOR VISUALISATION



RESULTS

At first, flow blurring injectors were fabricated having suitable dimensions. In this experiment, 2d injectors having square cross section were used in order to remove distortion caused by total internal reflection phenomena. Penetration lengths of liquid were calculated at various air to liquid ratios (ALRs). more the penetration length, more finer will be spray particles.



DROPLET BREAKUP SETUP

Atomization is the transformation of a bulk liquid into a spray of liquid droplets in a surrounding gas or vacuum. It is the process of converting an analyte in solid, liquid or solution form to a free gaseous atom.

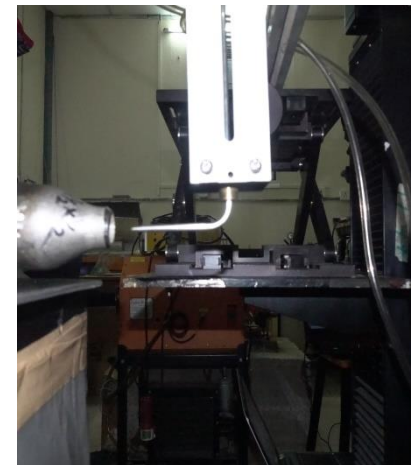
WORKING PRINCIPLE

It occurs as a result of the competition between the stabilizing influences of surface tension and viscosity of the liquid, and the disruptive actions of various internal and external forces.

- Various modes of breakup were observed depending upon various flow rates of air.
- PHANTOM VEO 710 high speed camera was also used for this experiment for visualization of these regimes.

RESULTS

At first, weber number was calculated in this experiment with the help of surface tension, diameter, density and velocity of air. Accordingly, particular breakup regimes (vibrational, bag, bag with stamen, catastrophic) were observed. We repeated the same experiment for multifluids such as glycerol, ethanol etc. and observed breakup regimes at different range of weber and ohnesorge number.



ACKNOWLEDGMENT

I wish to express my sincere gratitude to **Dr. Pankaj kolhe**, Assistant professor , Department of Mechanical Engineering,IIT Hyderabad for providing me an opportunity to do my project work on “Transparent injector visualization and setting up of droplet breakup rig" in “IIT HYDERABAD" . I sincerely thank to Surendra Kumar Soni,a P.H.D Scholar,IIT Hyderabad for guidance and encouragement in carrying out this project work .I also wish to express my gratitude to the officials and other staff members of “**NPIU-MHRD TEQIP IIT Hyderabad**" who rendered their help during the period of my project work, for their kind co-operation to the completion of my project work. Last but not least I wish to thank **TEQIP BIT MESRA** for this opportunity, express a sense of gratitude and love to my friends and my beloved parents for their manual support, strength, help and for everything Place.