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Study Of Flash And Fire Point Of Printing Inks (Cymk) Model For Letterpress & Lithographic Printing Techniques

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Abstract
The present paper deals with the study of Flash and Fire Point of Printing inks taking in special consideration Letterpress and Lithographic Printing Techniques. The results so obtained were helpful in press operators to select suitable and safe working temperature and saving their life from hazardous effects.
Keywords: *Lithographic Printing Techniques, Printing inks, Letterpress.*

1- INTRODUCTION

Inks occupy an integral and versatile position in our daily lives. Our day begins on sleepy note with newspapers and toiletries to breakfast table which is replete with several ink labeled, packaged consumer products such as tea or coffee, bread, butter and then gradually moving to our work places schools or offices which have myriad ink laden products be it books, calendars, photocopies, computer prints, stamps or even money, ink is found everywhere. Generally, ink is an organic or inorganic pigment or dye dissolved or suspended in a solvent. However, chemically, it is viewed as a colloidal system of fine pigment particles, coloured or un-coloured, dispersed in an aqueous or organic solvent.

The first inks were reportedly fruit or vegetable juices; protective secretions from cephalopods such as squid, cuttlefish, and octopus; blood from some types of shellfish; and tannin from galls, nuts, or bark from trees. It is believed that the appearance of the first man made ink dates back to 4,500 years in Egypt, which consisted of a mixture of animal or vegetable charcoal (lampblack) and glue. The earliest black writing inks, developed before 2500BC, were suspensions of carbon, usually lampblack, in water stabilized with a natural gum or materials like egg albumen. Modern inks are complex formulations. Along with the pigment, they also contain some additional ingredients collectively known as 'vehicle' in varying levels. These exemplify pH modifiers, humectants to retard premature drying, polymeric resins to impart binding and allied properties, deformer/antifoaming agents to regulate foam efficiency, wetting agents such as surfactants to control surface properties, biocides to inhibit the fungal and bacterial growth that lead to fouling, and thickeners or rheology modifiers to control ink application. Thus, in other words, printing of one form or the other another has been there with us for centuries; while the primary functions of decoration and information remain same, the technologies of both the printing process and the ink formulations have changed considerably.

Today's inks comprise two classes: printing and writing inks. The former is further broken down into two sub-classes: ink for conventional printing, in which a mechanical plate comes in contact with or transfers an image to the paper or object being printed on; and ink for digital nonimpact printing, which includes ink-jet and electro photographic technologies. Over 90 percent of inks are printing inks, in which colour is imparted by pigments rather than the dyes used in writing inks.

2- MATERIALS AND METHODS

Determination of Flash and Fire point for printing ink is one of the most important parameter in defining the usability of inks to various printing technologies, understanding of Flash and Fire point will give a detailed knowledge about usability of inks to a specific temperature, without this it is very dangerous for the working person on machine to set the temperature for printing. Flash and Fire point determination will also give us knowledge about the working temperature of inks, and with the help of this a machine operator can easily choose the thickness of material to be printed with accuracy. As it is a known fact that printing inks use solvents and many of these solvents are volatile organic compounds in nature and their flash and fire point depend upon the concentration of these solvents, a prior knowledge is must for proper functioning and print quality of print matter.

The flash point is one measure of the tendency of the test specimen to form a flammable mixture with air under controlled laboratory conditions. It is only one of a number of properties that should be considered in assessing the overall flammability hazard of a material. Flash point is used in shipping and safety regulations to define flammable and combustible materials. Flash point can indicate the possible presence of highly volatile and flammable materials in a relatively non-volatile or non-flammable material. This test method shall be used to measure and describe the properties of materials, products, or assemblies in response to heat and a test flame under controlled laboratory conditions and shall not be used to describe or appraise the fire hazard or fire risk of materials, products, or assemblies under actual fire conditions. However, results of this test method may be used as elements of a fire risk assessment that takes into account all of the factors that are pertinent to an assessment of the fire hazard of a particular end use. The fire point is one measure of the tendency of the test specimen to support combustion.This test method describes the determination of the flash point and fire point of test sample by a Pensky Marten's apparatus. Fire point is a parameter that is not commonly specified, although in some cases, knowledge of this flammability temperature may be desired.

Apparatus Required: Flash and fire point apparatus, match box, thermometer, and filter paper.

Principle; Flash point is the lowest temperature at which the lubricating oil gives off enough vapors that ignite for a moment when tiny flame is brought near it. Fire point is the lowest temperature at which the vapors of the sample burn continuously for at least five seconds when a tiny flame is brought near it. Significance Flash and fire points are used to indicate Fire hazard of products and evaporation loses under high temperature loses, It gives us the idea about the maximum temperature below which the product can be used.

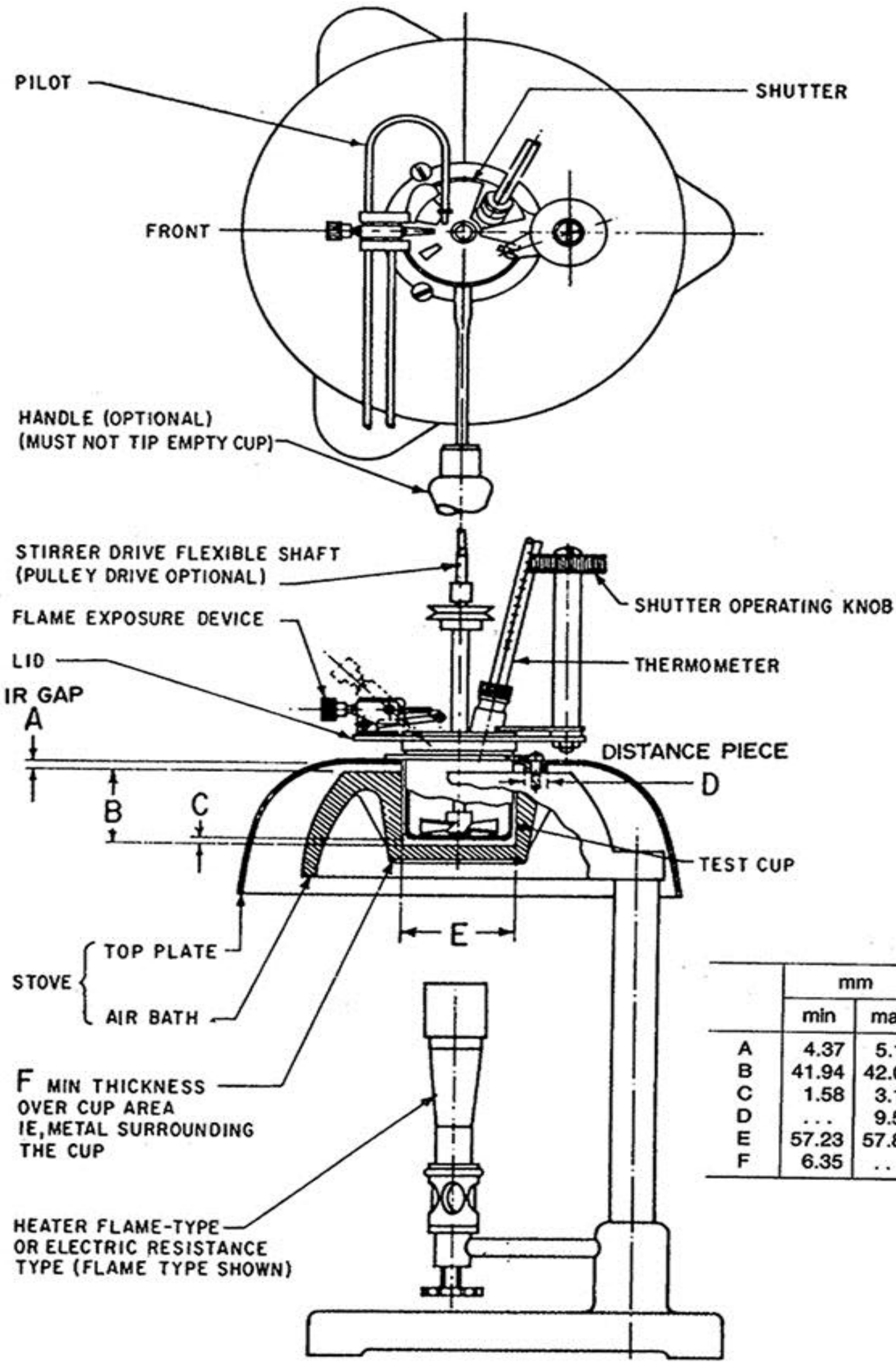
Description of Pensky Marten's Apparatus; It is used to determine the flash point of the sample, solvents, containing material and suspension of solids. It consists of three parts

(a) Sample Cup: Material Brass, Height 5.5cm, Diameter 5cm, Lid of the cup is provided with four openings of standard sizes, first opening is for stirrer, second is for admission of air, third is for thermometer and fourth is for introducing test flame.

(b) Shutter: At the top of the cup shutter is provided. By moving the shutter, opening in the lid opens and flame is dipped in to this opening, bringing the flame over the oil surface. As the test flame is introduced in the opening, it gets extinguished, but when the test flame is returned to its original position, it is automatically lightened by the pilot burner.

(c) Stove: It consists of Air bath, top plate on which the flange of the cup rest.

(d) Cup: The cup shall be of brass, or other non rusting metal of equivalent heat conductivity.



	mm		in.	
	min	max	min	max
A	4.37	5.16	0.172	0.203
B	41.94	42.06	1.651	1.656
C	1.58	3.18	0.062	0.125
D	. . .	9.52	. . .	0.375
E	57.23	57.86	2.253	2.278
F	6.35	. . .	0.25	. . .

NOTE 1—Lid assembly can be positioned either right or left-handed.

Pensky-Martens Apparatus

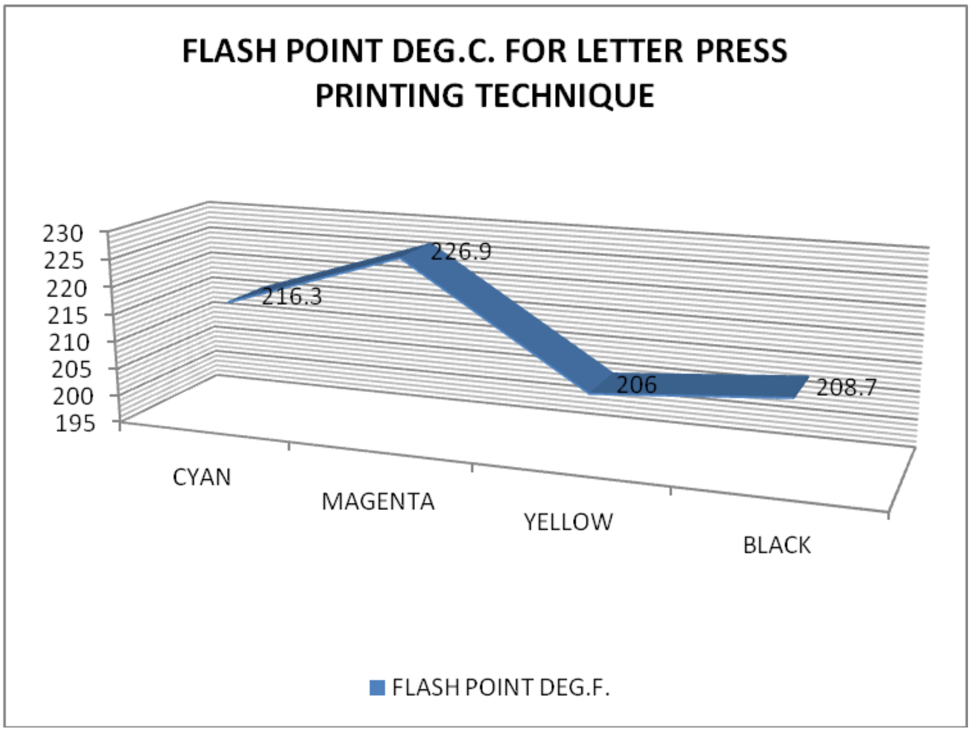
Procedure Clean and dry all parts of the apparatus with the help of suitable solvent e.g. CCl_4, ether, petroleum spirit or benzene and dry it to remove any traces of solvent. Fill the cup with the test sample up to the mark. Fix the lids on the top through which are inserted a thermometer and a stirrer. Ensure that the flame exposure device is fixed on the top. Light the test flame and adjust it to about 4 mm in diameter. Heat apparatus as temp. of sample increases by 5 to 6^0 per min. as stirrer is continuously rotated. At every 5^0 C rise of temp. Introduce test flame into the sample vapor. This is done by operating the shutter. On moving knob of shutter, test flame is lowered in sample vapors through opening. When test flame causes a distinct flame in interior cup, note temp. which represent the flash point. Further heat the sample at the rate of 1^0C/min. and continue applying the test flame as before. The temperature at which the vapors of the sample give a clear and distinct blue flash for five seconds is recorded as the fire point of the sample.

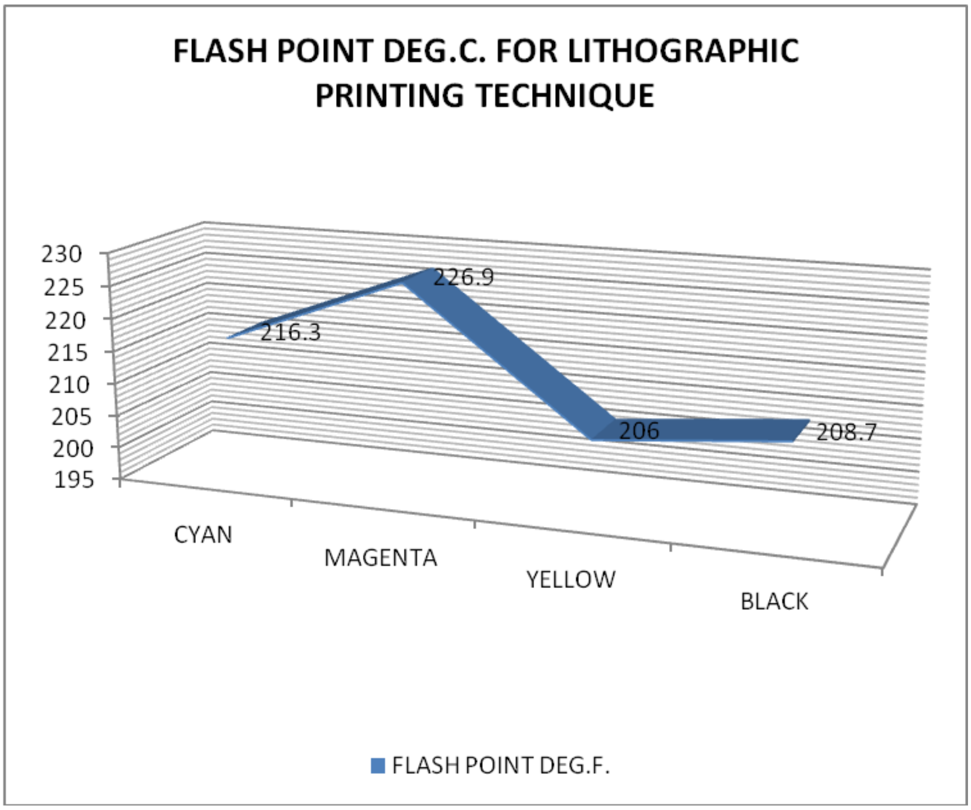
3- RESULTS AND DISCUSSION

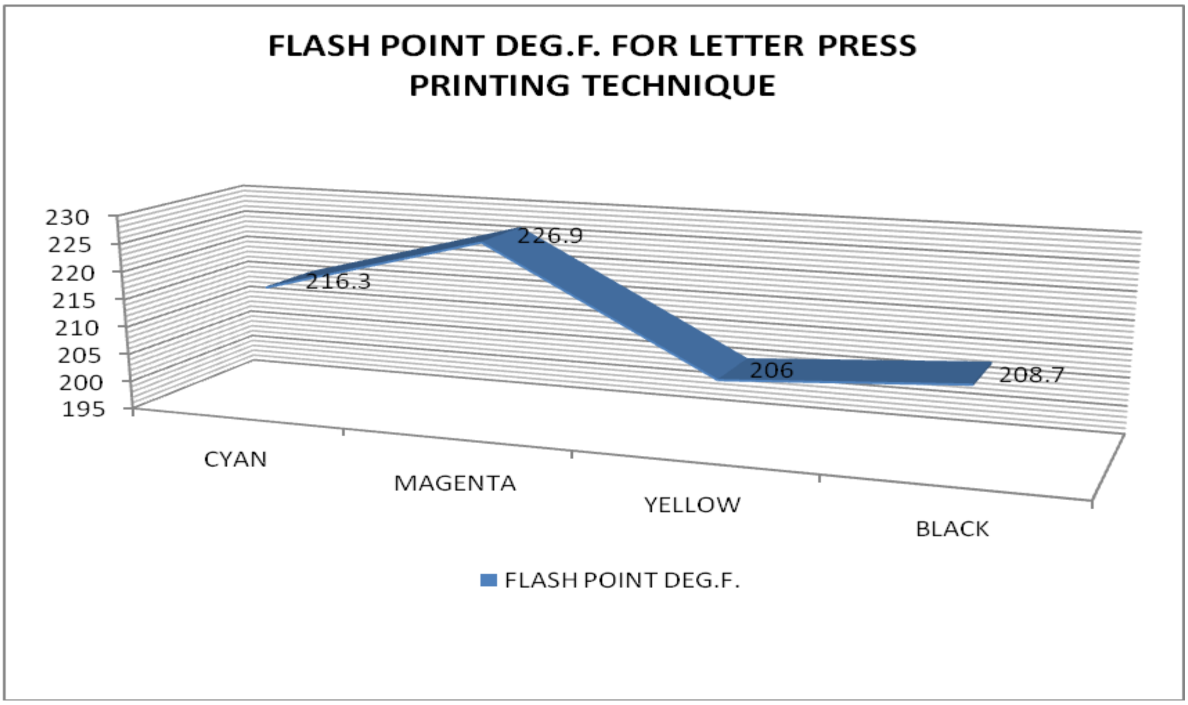
For determination of Flash and Fire points of Letter Press and Lithography Printing technique all four colour inks were used they are Cyan Ink, Magenta Ink, Yellow Ink and Black Ink. With the help and Flash and Fire point apparatus their flash and fire point were noted. Results clearly indicate that there has been a remarkable effect of temperature on ink performance and its usability, the results clearly indicates the safe temperature to which a user can use the inks under safe temperatures.

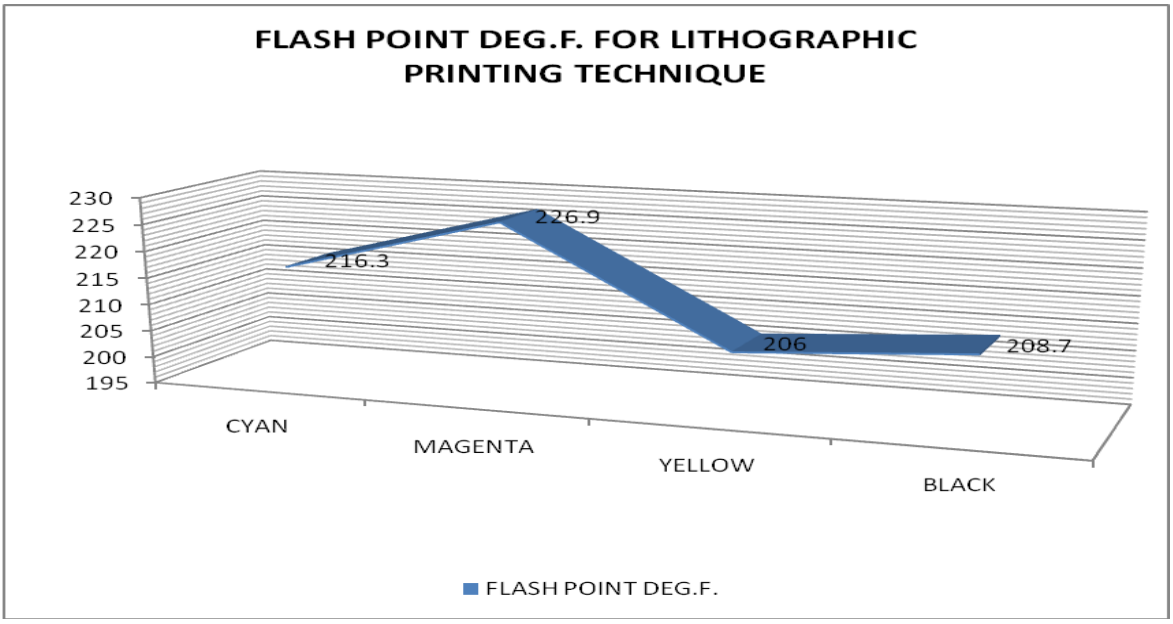
FLASH AND FIRE POINT MASTER TABLE

Sample Number	Printing Technology	Ink Colour Type	FLASH POINT		FIRE POINT	
			^oC	^oF	^oC	^oF
Sample – 1	Letter Press	Cyan Ink	93.7	200.6	102.4	216.3
Sample – 2	Letter Press	Magenta Ink	95.9	204.6	108.3	226.9
Sample – 3	Letter Press	Yellow Ink	89.2	192.5	96.7	206.0
Sample – 4	Letter Press	Black Ink	91.8	197.2	98.2	208.7
Sample – 5	Lithography	Cyan Ink	85.4	185.7	91.5	196.7
Sample – 6	Lithography	Magenta Ink	87.6	189.6	93.2	199.7
Sample – 7	Lithography	Yellow Ink	82.4	180.3	87.1	188.7
Sample – 8	Lithography	Black Ink	79.9	175.8	85.4	185.7


FLASH POINT DEG.C. FOR LETTER PRESS PRINTING TECHNIQUE
230
225
220
215
210
205
200
195
216.3
226.9
206
208.7
CYAN
MAGENTA
YELLOW
BLACK
FLASH POINT DEG.F.


FLASH POINT DEG.C. FOR LITHOGRAPHIC PRINTING TECHNIQUE
230
225
220
215
210
205
200
195
216.3
226.9
206
208.7
CYAN
MAGENTA
YELLOW
BLACK
FLASH POINT DEG.F.





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