19D100009 - Atharva Lagwankar

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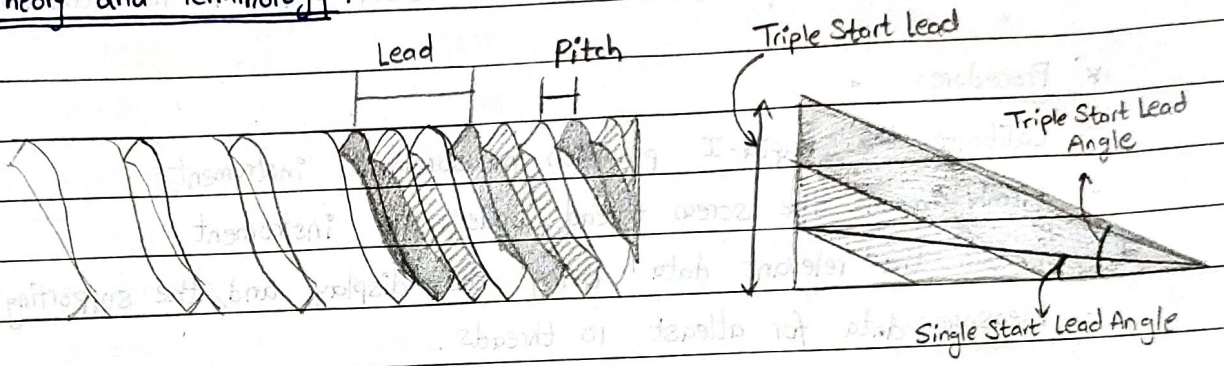
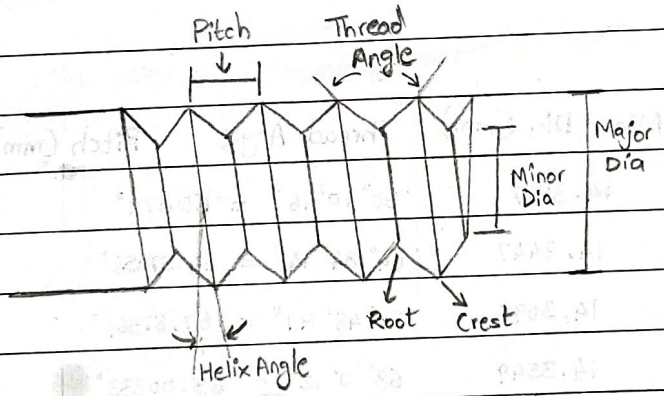
ME 372

Exp 4A : Inspection of Screw Thread

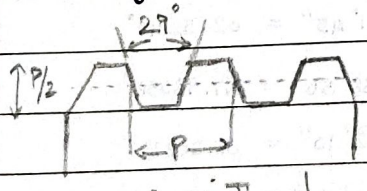
* **Aim**: To inspect the screw thread for pitch, thread angle, major and minor diameters and to determine pitch errors.

* **Theory and Terminology**:

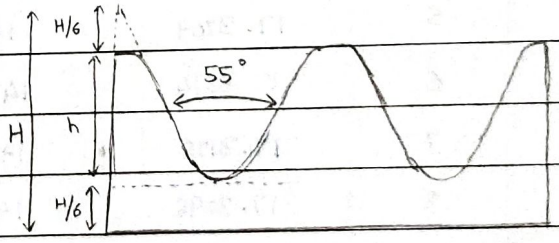




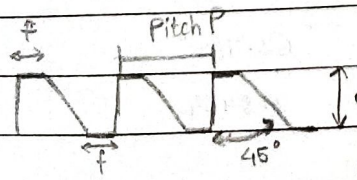
Thread Types:



Acme Thread



Whitworth Thread



Buttress Thread

Option ① $d = 3/4\,P$ & $f = 1/8\,P$

Option ② $d = 2/3\,P$ & $f = 1/6\,P$

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Acme Screws : Slower rotational speeds, heavy loads

Buttress Screws : Heavy loads with unidirectional force

Standard V-threads (60°) : Holding components together and positioning

- Types of Pitch Error :

- Progressive Pitch error : Occurs when tool-work velocity ratio constant but incorrect
- Periodic Pitch error : Occurs when tool-work velocity ratio is not constant

* Procedure :

- Calibrate the Rapid-I precision measurement instrument
- Firmly mount the screw thread under the instrument
- Record the relevant data using the display and the supporting software.
- Measure data for atleast 10 threads.

* Observations :

	Major Dia (mm)	Minor Dia (mm)	Thread Angle	Pitch (mm)
1	17.5024	14.3157	60° 10' 16" = 60.1711°	2.4481
2	17.3718	14.3447	64° 34' 14" = 64.57056°	2.4481
3	17.3077	14.3096	57° 48' 49" = 57.81361°	2.5439
4	17.3503	14.3549	63° 0' 12" = 63.00333°	2.569
5	17.3709	14.3367	64° 22' 22" = 64.37278°	2.5199
6	17.3374	14.2724	62° 31' 45" = 62.52917°	2.5458
7	17.3178	14.2446	67° 58' 50" = 67.98056°	2.5201
8	17.3296	14.2681	61° 12' 10" = 61.20278°	2.5921
9	17.4437	14.3666	61° 23' 44" = 61.39556°	2.8520
10	17.4173	14.2280	64° 46' 37" = 64.77694°	2.6164
Mean	17.37489	14.3041	62.782°	2.51654
Std. Dev	0.06205	0.04827	2.8434	0.079228

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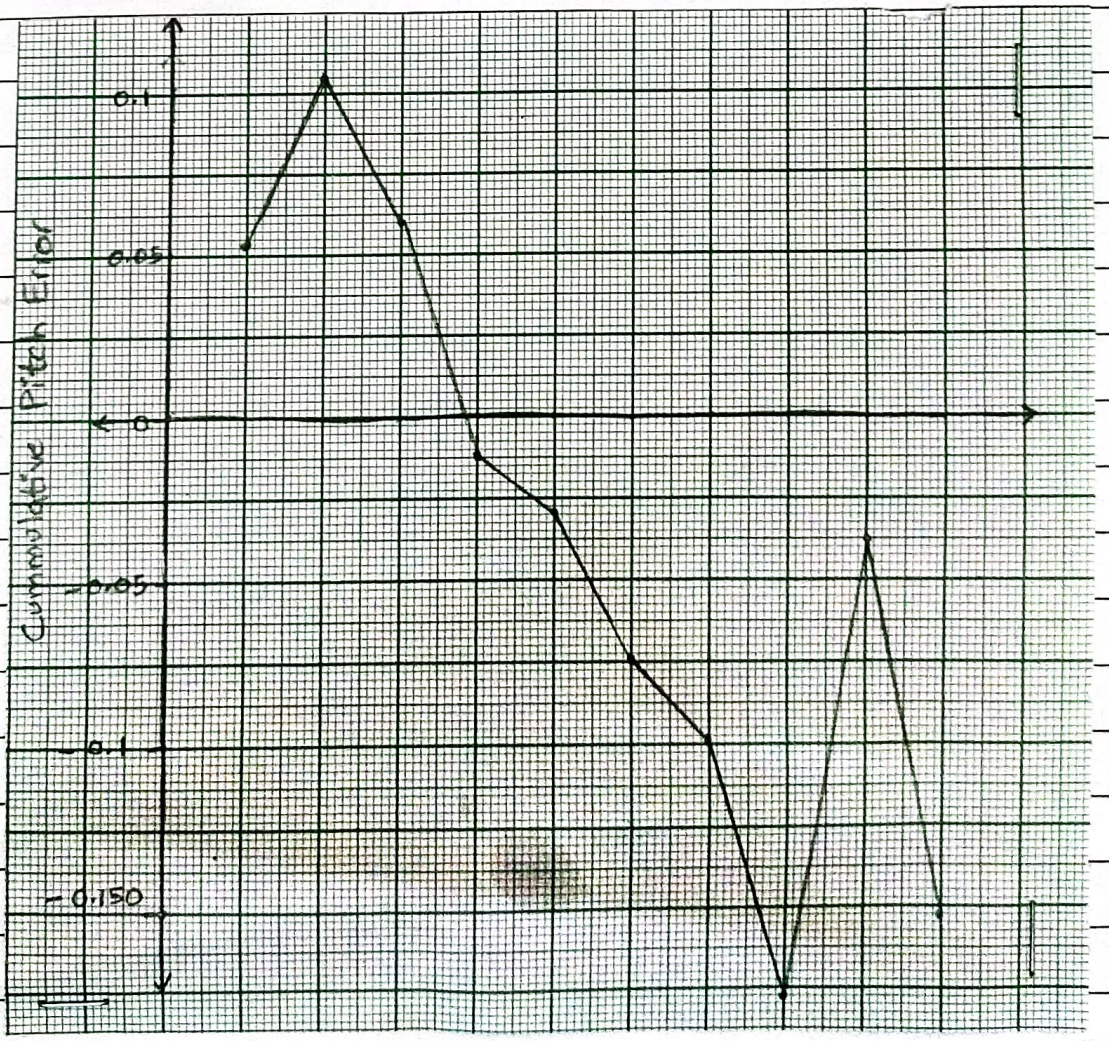
* Cumulative Pitch Error

Theoretical Pitch = 2.5 mm

Pitch	Pitch Error	Cummulative Pitch Error
2.4481	0.0519	0.0519
2.4481	0.0519	0.1038
2.5439	-0.0439	0.0599
2.569	-0.069	-0.0091
2.5199	-0.0199	-0.029
2.5458	-0.0458	-0.0748
2.5201	-0.0201	-0.0949
2.5921	-0.0921	-0.187
2.3520	0.148	-0.039
2.6164	-0.1164	-0.1554

Pitch error = Theoretical Pitch — Exp. Pitch



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* Based on the ~~pitch ang~~ thread angle value ($62.782 \pm 2.8434°$), we are dealing with an ISO metric screw thread ($\theta = 60°$)

- Sources of errors

- Instrument not focussed correctly on the thread tip.
- Error in measuring the distances and angles (start and end point might not be accurately chosen in the software)
- Layer of rust can lead to errors in thread angle measurements as well as the diameters.

Conclusions

- The observed screw thread was of the ISO metric screw thread.
- As per the cummulative pitch error, we can say that the pitch error is of periodic pitch error type. (tool-work velocity ratio not constant)