SNS COLLEGE OF TECHNOLOGY

(An Autonomous Institution)

COIMBATORE-35

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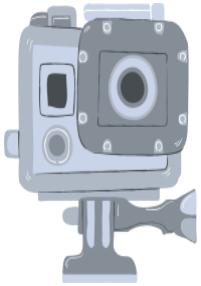
Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

COURSE NAME: 19EET205/ MEASUREMENTS AND INSTRUMENTATION

II YEAR / IV SEMESTER

Unit 2 –**MEASUREMENT OF POWER, ENERGY, AND MAGNETIC MEASUREMENTS**



Topic : LPF WATTMETERS

LPF WATTMETERS

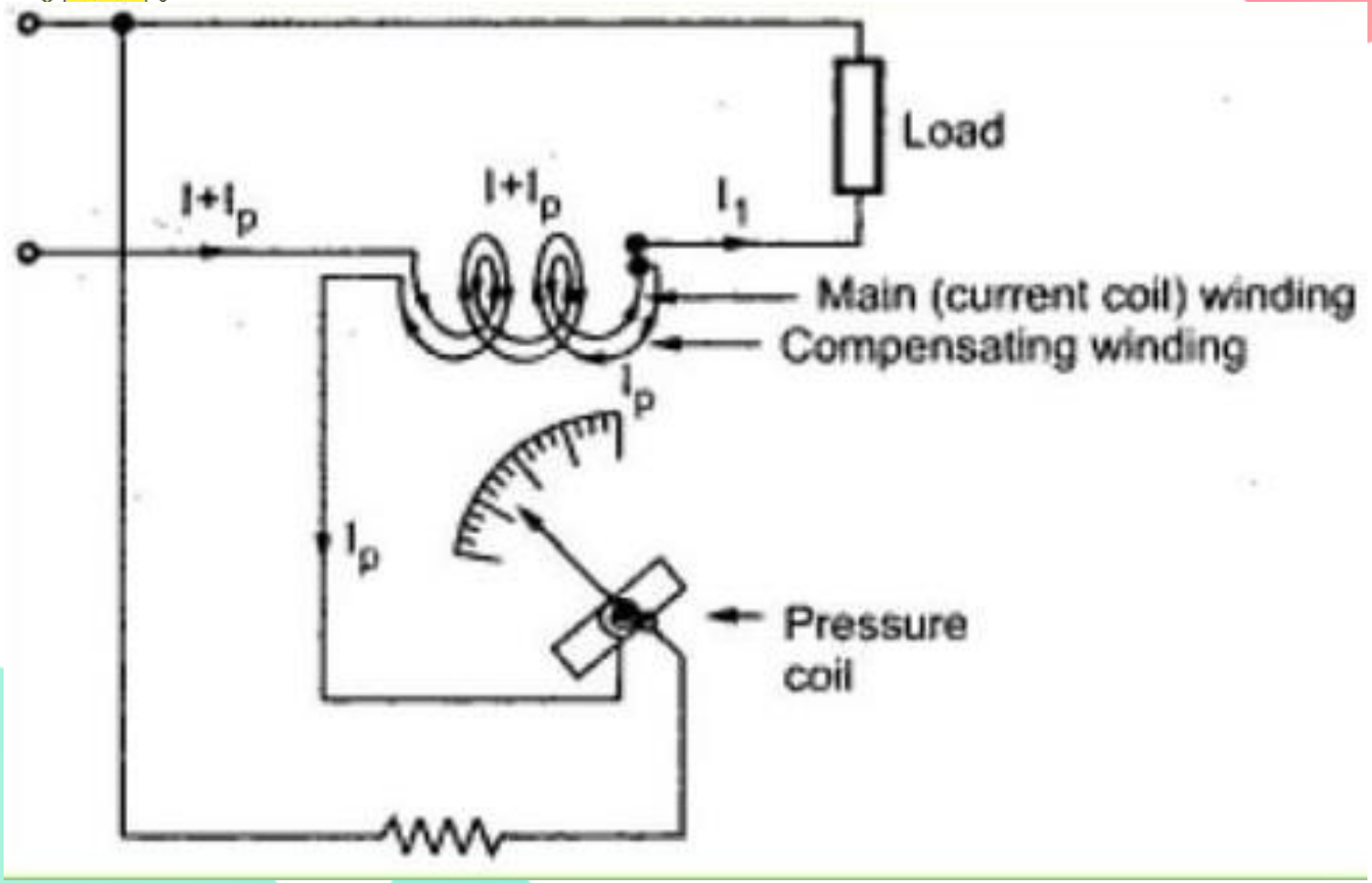
If any circuit is operating at low power factor then power in that circuit is difficult to measure with ordinary electrodynamometer wattmeters. The reading of the wattmeter is inaccurate on account of following reasons,

1. The deflecting torque on the moving system is small as the power factor is low even though the current and pressure coils are fully excited.
2. The inductance of pressure coil introduces considerable error at low power factors.

In order to get accurate reading from the wattmeter when it is measuring low power, extra adjustments are required to be made so that there will be compensation of the errors.

When power to be measured is low then the current in the circuit is high as the power factor is low. Thus in this case pressure coil can not be connected to supply side as otherwise large error will be produced because of large current flowing in current coil and corresponding power loss in current coil circuit is measured by wattmeter.

CIRCUIT DIAGRAM



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If pressure coil is connected to load side, power consumed by pressure coil is measured by wattmeter which is appreciable in comparison with power to be measured which is small. Hence it is necessary to compensate for pressure coil current in low power factor wattmeter. The compensated wattmeter is shown in Fig.

As shown in the Fig. the compensating coil is connected in series with the potential coil and is made as identical and coincident with current coil as possible. The current coil carries current $I+I_p$ and produces its own field proportional to this current. The compensating coil carries current I_p and produces field proportional to this current. This field acts in opposite direction to the field produced by current coil.

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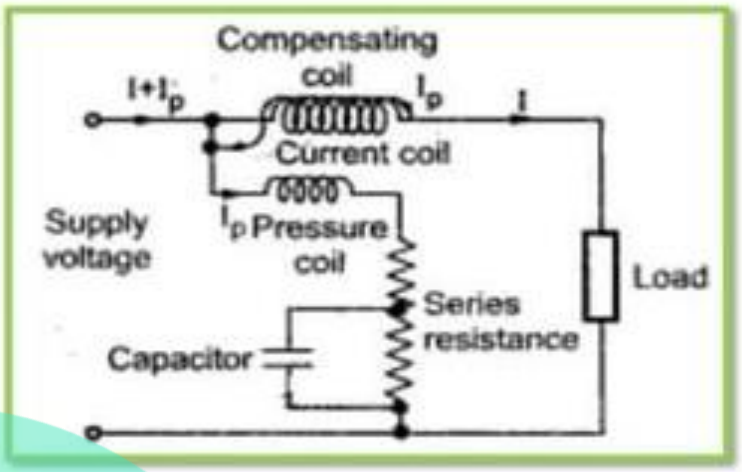
Thus the resultant field is due to current I only. Hence error due to pressure coil current is neutralized.

Thus at no load condition, the wattmeter should not deflect as the resultant current coil field is zero.

In case of low power factor wattmeter, the pressure coil circuit is designed for low resistance to increase the current flowing through it so as to have increased torque. In low power factor wattmeter the value of pressure coil current is 10 times the current in case of high power factor wattmeters.



the pressure coil inductance introduces error whose magnitude is given by $VI \sin\phi \tan\beta$. If power factor is low then ϕ is large and hence $\sin\phi$ is large. Thus the error introduced in the measurement is appreciable which must be compensated. It is compensated by connecting a capacitor across a part of series resistance in the pressure coil circuit which is shown in the Fig.