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COMPARATIVE EXPERIMENTAL EVALUATION OF A CURRENT TRANSFORMER AND A HALL-EFFECT CURRENT PROBE USED FOR MONITORING ACTIVE ELECTRICAL POWER ABSORBED BY AC DRIVE MOTORS

BY

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Abstract. This paper presents a comparative experimental study on the use of a toroidal AC current transformer and a Hall-effect-based current probe for measuring the instantaneous AC current absorbed by an electric motor driving a mechanical system (e. g. a car gear box, a lathe gear box). The measured AC current waveforms are then used to determine the active electrical power absorbed by the motor, which directly reflects the mechanical power delivered to the driven system. Experiments confirm a well-known effect: compared to a Hall-effect current probe (assumed to operate ideally), the AC current transformers introduce a positive phase shift, causing the measured waveform to lead the real current. Because of this positive phase shift, the measured instantaneous voltage and current exhibit an artificially increased phase difference, which leads to an inaccurate estimation of the active electrical power.

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A method for compensating this drawback is proposed. In addition, several limitations of current transformers in capturing severe transient regimes are illustrated.

Keywords: AC drive electromotor, mechanical systems, active electrical power, AC instantaneous current, AC current transformer, Hall-effect current probe.

1. Introduction

To describe the variation of active power consumed by an AC electrical motor (such as an electric motor driving a car gear box and a lathe gear box, running at idle) in our research), it is necessary first to measure the instantaneous variations of voltage and current, i.e., their waveforms. The voltage is measured using a conventional AC/AC transformer as an isolated sensing method, by acquiring the signal from its secondary winding. A voltage transformer provides galvanic isolation between its primary and secondary windings while stepping the voltage down to a lower level (Step Down Transformer, 2026).

Two main approaches are considered comparatively in this paper for sampling the AC instantaneous current waveforms absorbed by an electrical motor, both used as isolated sensing techniques: an old Romanian AC current transformer (with bulkier annular ferrosilicon core, STAS 4324-70, type CIBO-05, 100/5 A, Class 0.5, 5 VA, fully compatible with actually transformer Schneider Electric – series iCT / ACT / METSECT5, available on Echneider electric, 2026) and a Hall-effect current probe TA167 from PicoTechnology, UK (Oscilloscope probes, 2026). The AC current transformer (The Current Transformer, 2026) is widely used in the literature, as shown in (Zhang, 2024; Tang *et al.*, 2024; Koprivica and Milovanović, 2016; Kaczmarek, 2016; Chitariu *et al.*, 2024; Munteanu *et al.*, 2025). The Hall-effect current probe (Crescentini *et al.*, 2022; How Hall Effect Current Sensors Work, 2026) is also commonly employed, with examples found in (Anuchin *et al.*, 2019; Koteleva *et al.*, 2021; Li *et al.*, 2018).

The description of the instantaneous current waveforms sampled by these two different methods and the instantaneous voltage waveform (all of them sampled properly by a numerical oscilloscope) are subsequently used to determine and to analyze on computer the waveforms time evolutions and the active electrical power using Matlab. The instantaneous current waveform obtained with the Hall-effect current probe is considered the reference (ideal) method. The main objective is to experimentally confirm the known limitations of AC current transformers, specifically their tendency to introduce a positive phase shift in the measured instantaneous current (Dusza, 2025; Stano *et al.*, 2022) and their reduced accuracy in capturing transient phenomena (Ma and Crossley, 2018; Stano *et al.*, 2022; Zhang *et al.*, 2024), generally due to the core

magnetic saturation. A method for correcting the phase shift introduced by the AC current transformer will also be proposed and experimentally validated.

The rest of this paper is organized as follows: Section 2 presents the experimental setup and method, Section 3 discusses some experimental results, and Section 4 provides the conclusions.

2. Experimental Setup and Method

Figure 1 shows a schematic representation of the experimental setup. A three-phase AC power supply (pure sine wave) is used to feed an asynchronous electric motor (EM) used to drive a mechanical system.

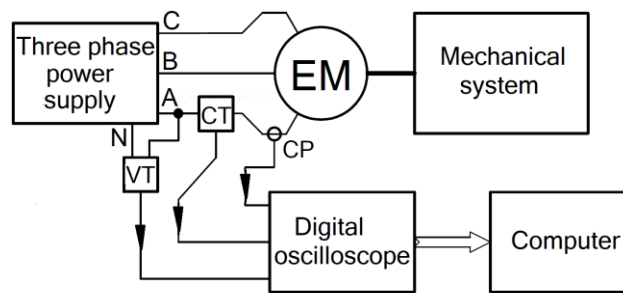


Fig. 1 – A brief description of the experimental setup.

On phase A of the supply circuit, a current transformer (CT) and a voltage transformer (VT) are installed. The primary winding of the VT is connected between phase A and the neutral conductor N. The secondary winding of the CT is shunted by a $6\text{-}\Omega$ resistor, so it now provides a voltage proportional to the instantaneous current $i_{CT}(t)$ (5.2229 A/V) flowing through phase A (as measured by the CT). The secondary winding of the VT provides a voltage proportional to the instantaneous phase-A voltage $u_{VT}(t)$ (as measured by the VT). A Hall-effect current probe (CP) is also installed on phase A. The output of the CP provides a voltage proportional to the instantaneous current $i_{CP}(t)$ flowing through phase A, with a sensitivity of 10 mV/A (as true current measured by the CP). Figure 2 shows the CT and VT transformers, which are part of an older, handmade experimental assembly. In the CT, the primary winding consists of a bar passing through the magnetic core and carrying both the input (I_w) and output (O_w) conductors, so phase-A current flows through both. Figure 3 shows the current probe CP, implemented as a clamp-type sensor placed around phase A.



Fig. 2 – A view on VT and CT transformers.

Fig. 3 – A view on CP current probe.

Figure 4 shows a first approach of the experimental setup previously illustrated schematically in Figure 1, using a car gearbox as the mechanical system driven by the electric motor. This configuration represents the first stage of our experiments. Some features of this setup were used for other experimental purposes.

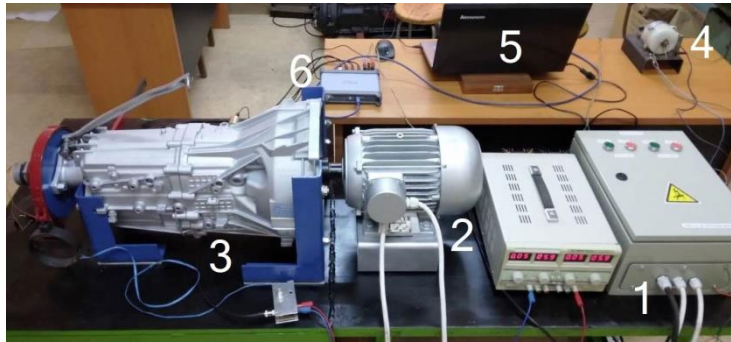


Fig. 4 – A first complete experimental setup: 1- power supply control system; 2 – electromotor; 3 – car gearbox as driven mechanical system; 4 – VT and CT transformers; 5 – computer; 6 – digital oscilloscope PicoScope 4824.

A power control system (1) supplies a three-phase asynchronous electric motor (2), with two selectable rotational speeds (750 and 1500 rpm synchronous speeds), is used to drive a car gear box (3), which serves as actuated mechanical system. A digital oscilloscope (6) (Picoscope 4824, 2026) is used for data acquisition and transfers the recorded signals to the computer (5). The oscilloscope samples the signals provided by the current transformer (CT) and its shunt resistor, the voltage transformer (VT) (both indicated as 4), and the Hall-effect current probe (CP), which is not visible in Figure 4.

Some features of a second approach of the experimental setup are partially described in Figures 5 and 6.



Fig. 5 – A front view of the mechanical gearbox of a lathe, used as driven mechanical system (running in idle).



Fig. 6 – Position of the transformers and the current probe.

Figure 5 shows a front view of the electromechanical gearbox of a Romanian lathe (SNA 360), used as the driven mechanical system operating in idle mode. Figure 6 presents a rear view of the lathe, where the transformers and the current probe are positioned in their working configuration.

For each of the two experimental configurations -(I) using a car gear box as the mechanical load on the electric motor, and (II) using the lathe gearbox as the load- a combined experiment was performed, including both transient and steady-state operating conditions. In each case, the voltages $u_{VT}(t)$ and currents $i_{CT}(t)$, $i_{CP}(t)$ were recorded.

A direct comparison between the currents can be performed by analyzing their phase shift, or indirectly by evaluating their influence on the active electrical power (AEP) absorbed by the motors. One of the most effective ways to obtain AEP from the instantaneous electrical power (IEP) -as previously discussed in (Chitariu *et al.*, 2024; Munteanu *et al.*, 2025)- is by applying a moving average filter (Moving Average Filter, 2026).

Suppose we have N samples of the signals $u_{VT}(t)$, $i_{CT}(t)$ and $i_{CP}(t)$. With a sampling interval Δt , time can be expressed as $t=k \cdot \Delta t$, and the samples can be written generically as $u_{VT}[k]$, $i_{CT}[k]$, and $i_{CP}[k]$, with k being an integer from $1 \div N$ (as the integer part of the ratio $t/\Delta t$). From these, two generic samples of IEP can be defined:

$$p_{CT}[k] = 3 \cdot u_{VT}[k] \cdot i_{CT}[k] \quad (1)$$

$$p_{CP}[k] = 3 \cdot u_{VT}[k] \cdot i_{CP}[k] \quad (2)$$

Eq. (1) is based on the current delivered by CT; Eq. (2) is based on the current delivered by CP. The factor 3 means that the IEP is estimated across all three phases.

These numerical IEP signals can then be numerically filtered using a moving average filter to obtain the corresponding AEP signals. A sample h of AEP ($P_{CT}(h)$ from Eq. (1) and $P_{CP}(h)$ from Eq. (2)) occurs by calculus as:

$$P_{CT}[h] = \frac{1}{n} \sum_{i=1}^n p_{CT}[h + 1 - i] \quad (3)$$

$$P_{CP}[h] = \frac{1}{n} \sum_{i=1}^n p_{CP}[h + 1 - i] \quad (4)$$

In Eqs. (3) and (4) n is the number of samples in the average, with $h=n \div N$.

The key element of this filtering process, which enables the correct extraction of the AEP from the IEP, is the choice of the value n . For a sampling frequency $f_s=1/\Delta t$ of the signals $u_{VT}(t)$, $i_{CT}(t)$, and $i_{CP}(t)$, the value of n must be chosen as an integer such that $f_s/n \approx 100$ Hz. The value 100 Hz corresponds to the first notch (zero) frequency of the moving average filter, with the next notches occurring at 200 Hz, 300 Hz, and so on. It is well known that, for a 50 Hz electrical supply network, the IEP contains a dominant periodic component with the sinusoidal fundamental at 100 Hz, together with harmonics at 200 Hz, 300 Hz, etc. If this fundamental and its harmonics are removed somehow from the IEP (for example, by applying a moving average filter with $n=\lfloor f_s/100 \rfloor$), then the resulting signal provides an estimate of the AEP.

Frequently, the IEP also contains a periodic component with harmonics starting from 50 Hz, which should also be removed by filtering. For this reason, filtering with $n=\lfloor f_s/50 \rfloor$ is often chosen. In this case, all sinusoidal components at 50 Hz, 100 Hz, 150 Hz, 200 Hz frequency and so on are removed by the filter.

This paper investigates how a current transformer (CT) describes the evolution of the instantaneous current relative to a current probe (CP), including a comparison of the time evolution of the active electrical powers $P_{CT}(h)$ and $P_{CP}(h)$.

3. Experimental Results and Discussion

There is a first important question: is it able the current transformer to describe correctly transient regimes? Using the experimental configuration I (with the car gear box in idle as driven mechanical system), an experiment with transient regime (starting the electric motor on first speed, with the gearbox on the fourth gear ratio), transient regime and stop was performed. The time evolution of $i_{CT}(t)$ and $i_{CP}(t)$ (with $N=1,000,000$, sampling frequency $f_s=100,000$ s⁻¹ and sampling interval $\Delta t=10$ μs) is described in Figure 7.

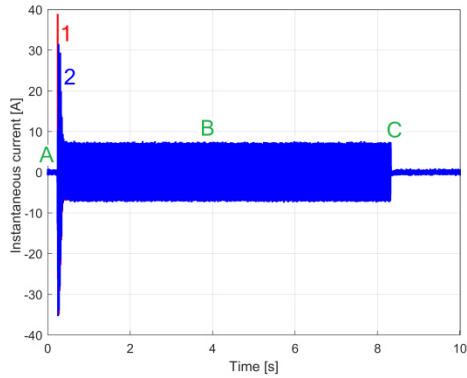


Fig. 7 – The time evolution of currents $i_{CT}(t)$ (1) and $i_{CP}(t)$ (2), during an experiment on configuration I.

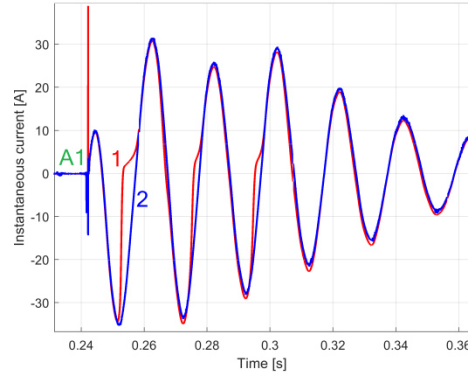


Fig. 8 – A zoom into A region of Figure 7.

In region A, the motor starts abruptly (being directly connected to the power supply network) while the car gear box is running in idle. This is followed by a period in which the motor operates in steady-state (region B), and then by the stopping phase (region C). A zoom into the A region (Figure 8) reveals the relatively small difference between the time evolutions of the currents $i_{CT}(t)$ (1) and $i_{CP}(t)$ (2). This is a first example of the difference in current mirroring during the transient regime (between the current measured by CT and the current measured by CP). A zoom into region A1 of Figure 8 (shown in Figure 9, corresponding to the moment when the electric motor is switching on) highlights this difference more clearly (during high-speed events).

Figure 10 presents a zoom into region B of Figure 7, where the electric motor and its load operate in steady-state regime.

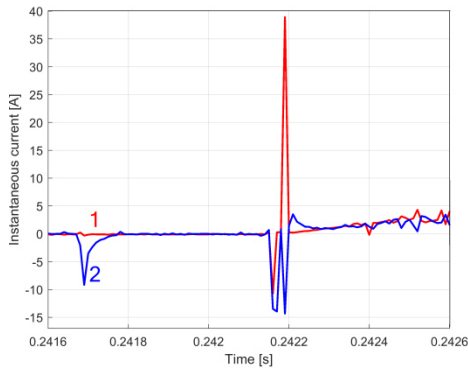


Fig. 9 – A zoom into A1 region of Figure 8.

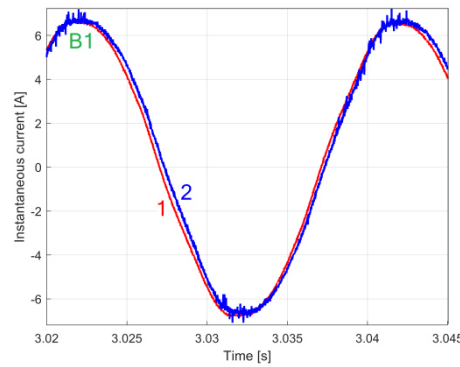


Fig. 10 – A zoom into B region of Figure 7 (2500 samples).

A zoom into region B of Figure 10 is shown in Figure 11. Once again, the differences between the currents are evident, with the transient phenomena being more clearly captured in the time evolution of $i_{CP}(t)$.

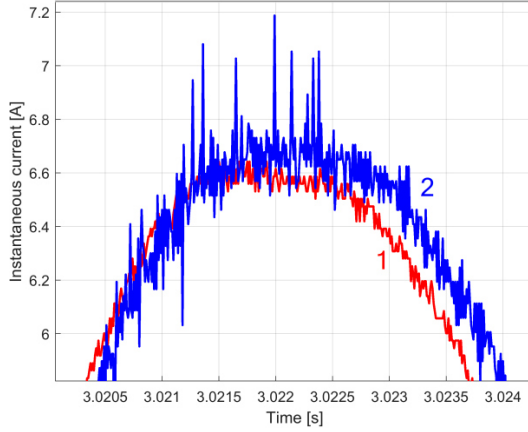


Fig. 11 – A zoom into B1 region of Figure 10.

the CT introduces a positive phase shift -as assumed in Section I (Dusza, D., 2025; Stano, E. *et al.*, 2022)- when describing $i_{CT}(t)$. In other words, in Figure 10, curve 1 leads curve 2. The fact that curve 1 precedes curve 2 is more evident in Figure 12, which reproduces Figure 10 but with that short sequences (SS) of instantaneous currents low-pass filtered (using a moving-average filter, with 100 samples in the average for both signals).

This phase shift is highlighted more clearly when a planar representation is made in a Cartesian coordinate system using the SS from Figure 12, with the $i_{CT}(t)$ current (curve 1) on the ordinate and the $i_{CP}(t)$ current (curve 2) on the abscissa. Thus, as shown in Figure 13, an elliptical trajectory is obtained as a Lissajoux figure (Lissajoux Figures, 2026), with a non-zero minor semi-axis, due to this phase shift. This is a graphical result of the superposition of two phase-shifted sinusoidal waves.

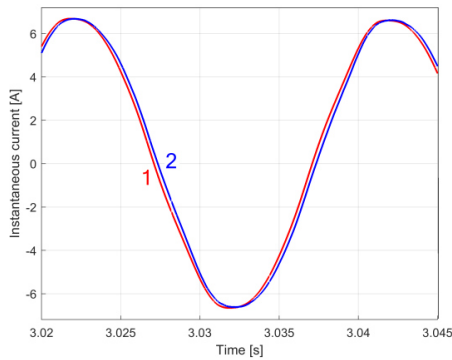


Fig. 12 – The low-pass filtered waveforms from Figure 10.

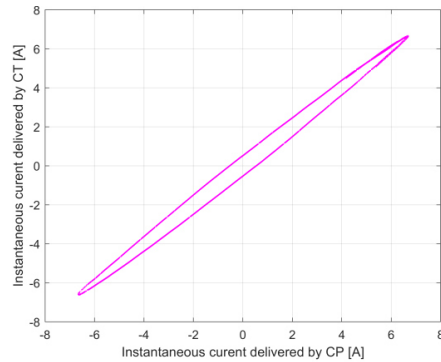


Fig. 13 – A Lissajoux figure, with $i_{CT}(t)$ on ordinate and $i_{CP}(t)$ on abscissa (both represented in Figure 12).

It is clear that the quality of the rapid transient phenomena captured by the instantaneous current $i_{CT}(t)$, measured using the CT, is significantly degraded compared to reality, which is detrimental for monitoring and diagnostic purposes of the driven mechanical system. It appears that, for the moment, there is no available method to eliminate this inconvenience.

With reference to Figure 10, it is confirmed that

Assuming that this phase shift is constant (so the SS waveform $i_{CT}(t)$ (1) precedes the SS waveform $i_{CT}(t)$ (2) by a time t_d), this inconvenience can be easily eliminated. The samples of the SS of instantaneous current $i_{CT}(t)$ can be artificially shifted to the right (delayed) by a time t_d , approximated as $t_d = s \cdot \Delta t$, where $s = \lfloor t_d / \Delta t \rfloor$ is an integer number of samples. The samples of the SS of delayed current ($i_{CTd}(t)$) are defined numerically with:

$$i_{CTd}[k + s] = i_{CT}[k] \quad \text{with } k = 1 \div N - s \quad (5)$$

First s samples from SS of $i_{CTd}(t)$ are undefined, and can conventionally be considered zero.

$$i_{CTd}[k] = 0 \quad \text{with } k = 1 \div s \quad (6)$$

From the SS waves shown in Figures 12 and 13, and based on Eqs. (5) and (6), a first straightforward method to determine the value of s (and indirectly t_d) is to increase progressively s -starting from one- until the superposition of these SS of the instantaneous currents $i_{CTd}(t)$ and $i_{CP}(t)$ ideally forms a line segment, that is, an ellipse with a zero minor semi-axis.

With $s = 24$, the closest approximation to a line segment was obtained, as shown in Figure 14. Because the SS waveforms are not perfectly similar, their superposition does not produce a perfect line segment. Figure 15 presents the equivalent of Figure 10 but with the best overlap of SS of currents (with $i_{CTd}(t)$ optimally delayed, with $s=24$).

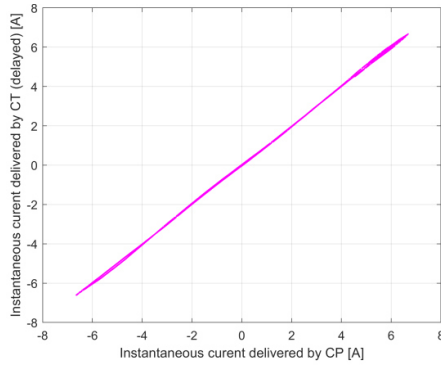


Fig. 14 – A Lissajoux figure, with SS of $i_{CTd}(t)$ (optimally delayed) on ordinate and SS of $i_{CP}(t)$ on abscissa.

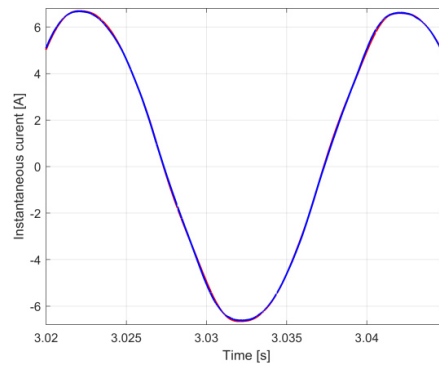


Fig. 15 – The equivalent of Figure 10 but using SS of $i_{CTd}(t)$ optimally delayed for the best possible overlap over $i_{CP}(t)$.

It is clear that the time delay is $t_d = s \cdot \Delta t = 24 \cdot 10 \mu s = 240 \mu s$. It is also evident that for an instantaneous current with period $T = 1/50 \text{ s}^{-1} = 20 \text{ ms}$ (corresponding to a 50 Hz frequency) the phase shift φ_{CT} introduced by the CT is experimentally determined as $\varphi_{CT} = t_d \cdot 360^\circ / T = 4.32^\circ$.

Figure 16 presents the filtered SS of $i_{CT}(t)$ and $i_{CP}(t)$ (the same as in Figure 12), with the SS of $u_{VT}(t)$ as curve 3 (not to scale). This highlights the phase shift φ_{V-C} between the voltage $u_{VT}(t)$ (3) and the current $i_{CP}(t)$ (2) related

by mechanical systems characteristics running at idle. Similarly Figure 17 presents the SS of $u_{VT}(t)$, $i_{CP}(t)$ and $i_{CTd}(t)$ optimally delayed ($s=24$).

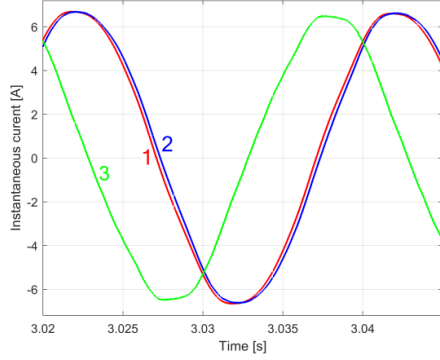


Fig. 16 – A view with filtered SS of $i_{CT}(t)$ (1), $i_{CP}(t)$ (2) and $u_{VT}(t)$ (3).

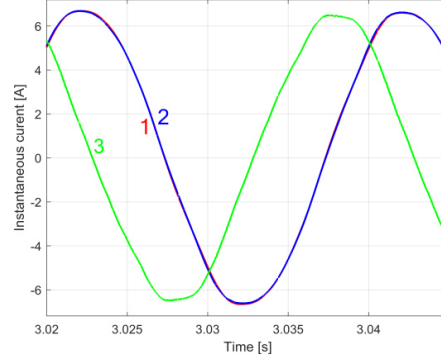


Fig. 17 – A view with filtered SS of $i_{CTd}(t)$ (optimally delayed), $i_{CP}(t)$ and $u_{VT}(t)$.

Figure 18 shows the overlaid time evolutions of the active electrical powers P_{CT} and P_{CP} for the entire experiment performed under configuration I, previously introduced in Figure 7. In this case, the full time evolution (FTE) of the instantaneous currents $i_{CT}(t)$ and $i_{CP}(t)$ and the voltage $u_{VT}(t)$ is used. Area A (zoomed in Figure 19) illustrates the start-up phenomenon, characterized by a sudden switch-on. The sharp increase in active electrical power is directly linked to the motor's and gear box starting dynamics. Area B (zoomed in Figure 20) corresponds to the steady-state operating regime. In Area C (zoomed in Figure 21) the motor is suddenly switched off.

Aside from the slightly different representations of the transient regimes (Figures 19 and 21), it is clear that the electrical power of the P_{CT} (1) is systematically higher than that of the P_{CP} (2), as shown in Figures 20 and 21.

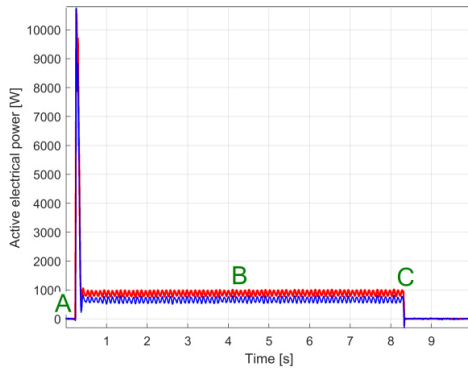


Fig. 18 – The time evolution of active electrical powers P_{CT} (1) and P_{CP} (2) during the entire experiment (configuration I).

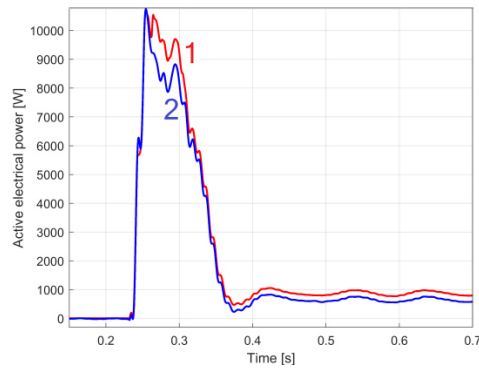


Fig. 19 – A zoom into A region of Figure 18.

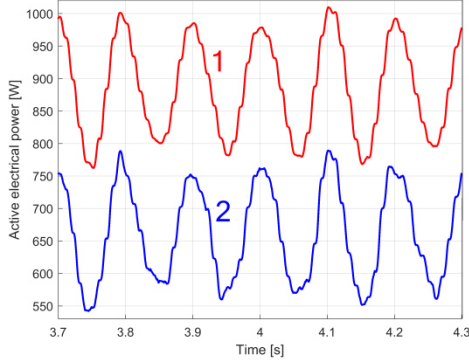


Fig. 20 – A zoom into B region of Figure 18.

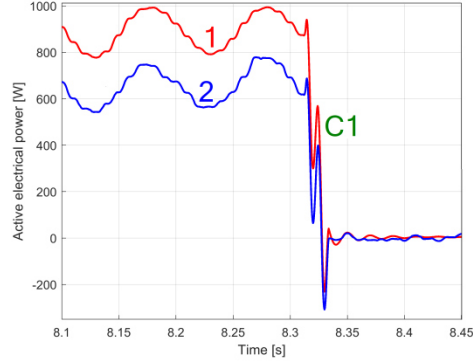


Fig. 21 – A zoom into C region of Figure 18.

This difference between the average values of P_{CT} and P_{CP} is primarily due to the positive phase shift ($\varphi_{CT} = 4.32^\circ$ previously determined) introduced by the CT. Conceptually, the active electrical power is defined as:

$$P = U \cdot I \cdot \cos(\varphi_{V-C}) \quad (7)$$

Here, U represents the root-mean-square (RMS) value of the voltage (i.e., the voltage amplitude divided by $\sqrt{2}$), I is the RMS value of the current (the current amplitude divided by $\sqrt{2}$), and $\cos(\varphi_{V-C})$ is the power factor, where φ_{V-C} denotes the phase shift between the instantaneous voltage and current (previously shown in Figure 17). Specifically, for the power P_{CT} , the phase shift φ_{V-CCT} (between $i_{CT}(t)$ and $u_{VT}(t)$) is used, while for P_{CP} the corresponding phase shift is φ_{V-CCP} (between $i_{CP}(t)$ and $u_{VT}(t)$). Since $\varphi_{V-CCT} < \varphi_{V-CCP}$ (approximately $\varphi_{V-CCT} + \varphi_{CT} = \varphi_{V-CCP}$), it follows that $\cos(\varphi_{V-CCT}) > \cos(\varphi_{V-CCP})$, and therefore the average value of P_{CT} is greater than that of P_{CP} .

We should specify that the variability of active electrical power in steady-state (zoomed into Figure 20) has a simple explanation: on the output shaft of the gearbox (Figure 4) there is a mechanical breaking system with a disk and break shoe. An improper position of the brake shoe, combined with the radial runout of the brake disc, explains this variation in active electrical power, which clearly stems from the variation in the mechanical braking force required from the electric motor's rotor.

Now we consider that the power P_{CT} is defined using FTE of $i_{CTd}(t)$ optimally delayed, with $s=24$ (as P_{CTd}). Similarly with Figures 19 and 20, Figures 22 and 23 shows zoomed in details of the overlaid time evolutions of the active electrical powers P_{CTd} and P_{CP} for the entire experiment performed under configuration I.

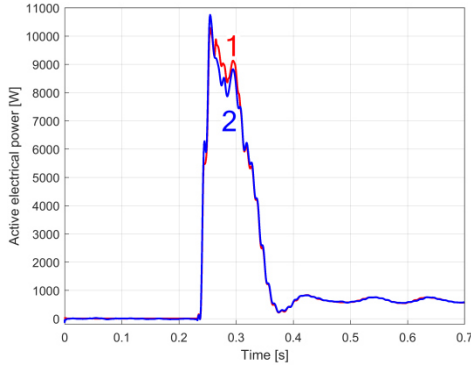


Fig. 22 – The equivalent of Figure 19 built with overlaid P_{CTd} and P_{CP} .

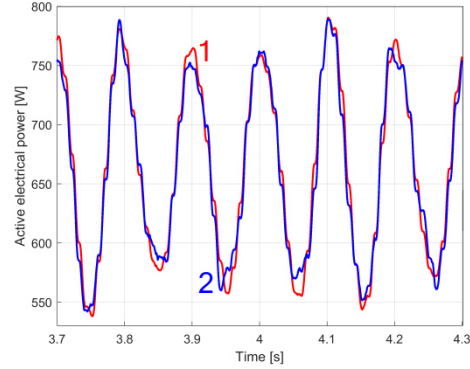


Fig. 23 – The equivalent of Figure 20 built with overlaid P_{CTd} and P_{CP} .

It is clear that the active electrical powers P_{CTd} and P_{CP} now overlap quite well. This provides a reasonable indication that applying a delay to the instantaneous current delivered by the CT is an appropriate approach. Naturally, some small discrepancies between P_{CTd} and P_{CP} remain due to the CT's imperfect behavior, as it cannot accurately reproduce the high-frequency components of the instantaneous current.

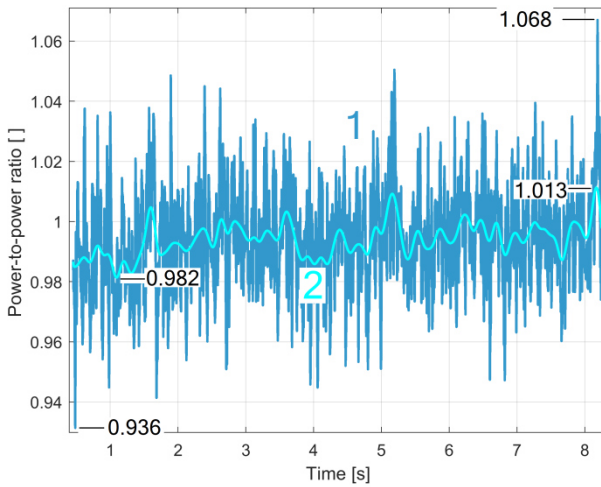


Fig. 24 – The time evolution of the power-to-power ratio P_{CTd}/P_{CP} : 1 – unfiltered; 2 – low pass filtered.

There is a way to highlight the coincidence of these two powers: the time evolution of the ratio P_{CTd}/P_{CP} calculated over the entire steady-state interval, as shown in Figure 24 (unfiltered (1) and low-pass filtered (2)). It is expected that if an appropriately chosen value of s is used (the previously proposed value was $s=24$) this will produce an average P_{CTd}/P_{CP} ratio as close as possible to one. With

$s=25$ the average value of the ratio P_{CTd}/P_{CP} is 0.9941. It was observed that any other value of s in the vicinity of 25 causes this average to drift away from one. For example, with $s=24$ the average becomes 1.0091, while with $s=26$ it becomes 0.9790. This suggests that this method used to identify the optimal value of s has been validated (with $\varphi_{CT}=4.5^\circ$ more precisely determined).

A new experiment on configuration II (this time using the lathe gear box, Figures 5 and 6 as driven by its electric motor) was performed, confirming the results obtained previously. Figure 25 shows the time evolution of the overlaid powers P_{CTd} (with $s=25$) and P_{CP} absorbed by electric motor during an experiment that begins with the mechanical engagement (point A, using an electromagnetic clutch) and ends with the mechanical disengagement (point C) of one part of the gear box, while the other part remains in operation throughout. The increase in rotational speed (up to 1041 rpm at the output shaft) occurs slowly due to the slipping of the electromagnetic clutch, which starts in A1 and ends in A2. At point B, the transient acceleration phenomena have ceased. Between B and C, the system operates in steady-state (with constant speed). At point C, the electromagnetic clutch is disengaged, the powers drop suddenly, and the rotational motion of that part of the gearbox stops. It should be noted that the power values return to their pre-A state, but are temporarily lower (in C1).

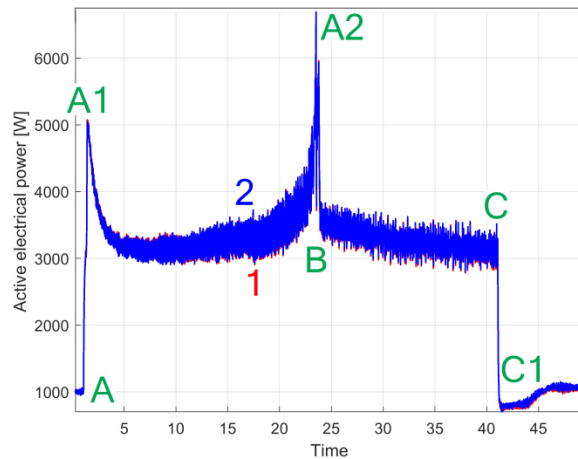


Fig. 25 – The time evolution of active electrical powers P_{CTd} (1) and P_{CP} (2) during a second experiment (configuration II).

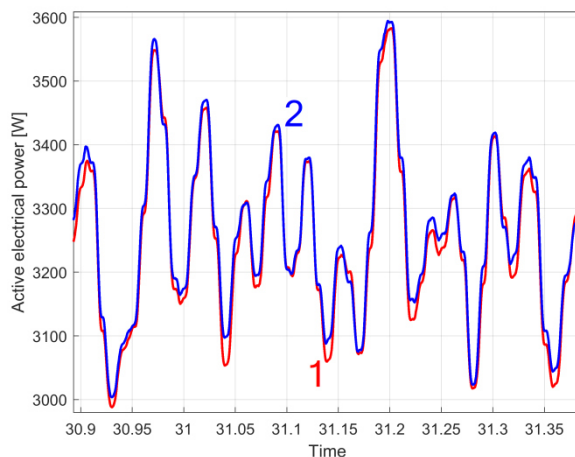


Fig. 26 – A zoom into the steady-state region of Figure 25 (between B and C).

This temporary drop in power describes the internal friction in the electromagnetic coupling after disengagement.

The quality of the overlap between the two powers P_{CTd} and P_{CP} can be observed in a zoomed in view of Figure 25, within the steady-state region (between labels B and C), as shown in Figure 26. In Figure 26, P_{CTd} is labeled as 1 and P_{CP} as 2. It is clear that the two curves fit quite well.

Curve 1 in Figure 27 presents the low-pass filtered time evolution of the power-to-power ratio P_{CTd}/P_{CP} (1.003 as average value) during the experiment described in Figure 25, while curve 2 presents the time evolution of the low-pass filtered power P_{CP} (no scale).

The evolution of curve 1 (using the same value of the variable $s=25$ as in the analysis of configuration I) demonstrates that the positive phase angle between the instantaneous current and the instantaneous voltage introduced by the current transformer does not change significantly with variations in active power. A more detailed analysis, however, shows that relatively small variations do occur, for example, when the gearbox is disengaged (in C moment).

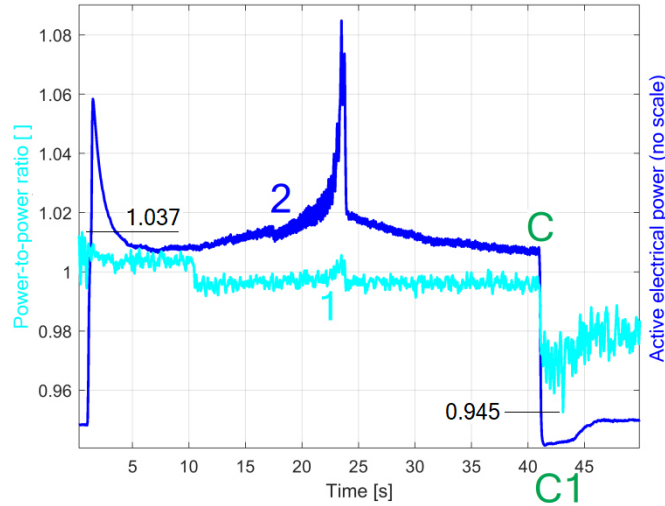


Fig. 27 – 1 - the evolution of power-to-power ratio P_{CTd}/P_{CP} (filtered); 2 - the active electrical power P_{CP} (not to scale).

4. Conclusions

This paper illustrates several functional limitations of a current transformer in accurately describing the instantaneous current absorbed by a three-phase asynchronous motor that drives mechanical systems (gear boxes in our experiments) across a wide range of power levels, under both steady-state and transient conditions. It was experimentally demonstrated that the current transformer introduces a positive phase shift of 4.5 degrees between the real instantaneous current and the measured current with the current transformer, and that this phase shift does not depend significantly on the value of the active electrical power absorbed by the motor. A method for eliminating this phase shift -based on numerically delaying the instantaneous current signal described by the current transformer- was proposed, tested, and experimentally validated. The undesirable influence of this phase shift on the evolution of active power was experimentally demonstrated, as were the effects of its removal. The limitations of the current transformer in describing transient conditions were also experimentally demonstrated, although no solutions for mitigating these limitations were proposed for the time being.

However, the use of a current transformer to measure instantaneous current remains a viable, cheaper option, as it was demonstrated in several previous studies. (Chitariu D.-F., Horodinca M., *et al.*, 2024 and Munteanu A., Horodinca M., *et al.*, 2025).

A future approach will focus on improving the ability of a current transformer to correctly describe the instantaneous current, particularly under transient operating conditions.

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EVALUARE EXPERIMENTALĂ COMPARATIVĂ A UNUI TRANSFORMATOR DE CURENȚ ȘI A UNEI SONDE DE CURENȚ CU EFECT HALL UTILIZATE PENTRU MONITORIZAREA PUTERII ELECTRICE ACTIVE ABSORBITE DE MOTORELE DE ACȚIONARE DE CURENȚ ALTERNATIV

(Rezumat)

Lucrarea propune un studiu comparat pentru două metode de prelevare a semnalului de descriere a curentului instantaneu absorbit de un electromotor de curent alternativ utilizat în antrenarea mecanică a două tipuri diferite de cutii de viteze. Se utilizează un senzor (sondă) de curent cu efect Hall (considerat ca traductor de referință) simultan cu un transformator de curent alternativ, în descrierea unor experimente caracterizate de regimuri relativ severe, tranzitorii și staționare, de absorbție de curent

(putere aelectrică activă). S-a constatat faptul că transformatorul de curent introduce un defazaj pozitiv în descrierea curentului instantaneu, s-a determinat valoarea acestui defazaj (4,5 grade) și s-a propus și validat experimental o metodă de eliminare a acestuia. Existența defazajului și eliminarea sa s-a ilustrat și în cazul descrierii experimentelor prin evoluția puterii electrice active. S-a ilustrat de asemenea incapacitatea transformatorului de curent de a descrie corect regimurile sever tranzitorii.