THE EFFECTIVENESS OF USING TRAFFIC LIGHTS WITH A COUNTDOWN TIMER.

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On the path to traffic safety and efficiency, new technologies play a key role. One of the latest innovations being actively implemented in cities worldwide is the countdown timer display for traffic lights. This technology offers a unique way to optimize traffic flow and enhance road safety.

Many major cities worldwide have already successfully implemented countdown timer displays for traffic lights at their intersections. Examples include London, New York, Tokyo, and many other megacities. The positive results of such measures include improved safety, reduced congestion, and shortened travel times for drivers. [1].

The countdown timer display for traffic lights is one of the important innovations in traffic management and road safety. Its implementation promotes smoother traffic flow, reduces congestion, and lowers the risk of accidents. Therefore, it is a technology that deserves attention and widespread adoption in cities around the world. [2].

Traffic lights with countdown timer displays are an innovative system designed to enhance road safety and optimize traffic flow. These traffic lights are equipped with special displays that show a countdown timer indicating the time remaining until the signal changes.

The countdown timer display for traffic lights is a device installed on traffic lights that shows the remaining time until the signal changes from one state to another. This can be useful for both drivers and pedestrians, allowing them to assess how much time they have left before the signal in their direction of travel changes. Such displays are often used at intersections with heavy traffic to enhance safety and traffic efficiency [2].

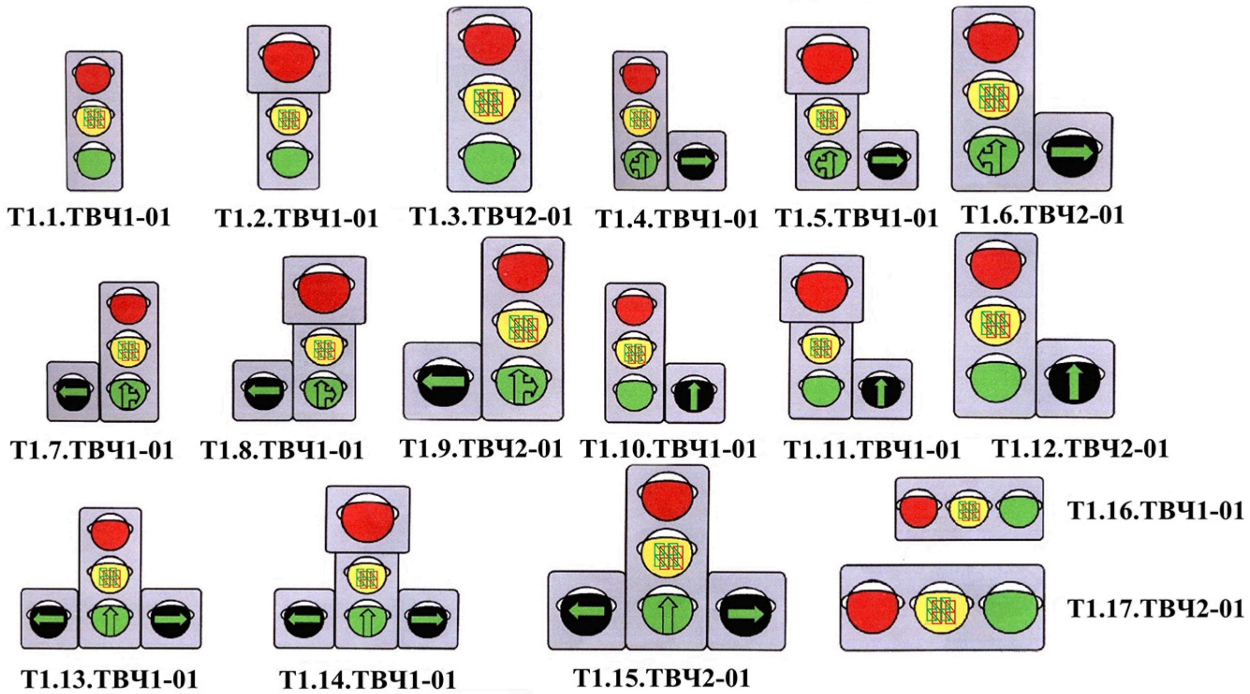
Traffic lights with countdown timer displays may vary in design and functionality, but the main types include (see figures 1-3):

1.Traffic lights with digital displays. This type of traffic light typically features a digital display showing the countdown timer until the signal changes. The numbers may be presented in seconds, and the timer may start counting down from the full cycle of the traffic light (for example, from 60 to 0 seconds).

2. Traffic lights with analog displays. These traffic lights feature an analog display represented by an arrow or a bar that gradually decreases as it approaches the moment of signal change. Unlike digital displays, analog displays may be more intuitively understandable for drivers [3].

3. Traffic lights with multi-level displays. Some traffic lights may have multi-level displays that show the time until the signal changes for each direction of travel at the intersection. This can be especially useful at complex intersections with difficult traffic flow.

4. Traffic lights with additional information. Some traffic lights with countdown timer displays may also show additional information, such as current wind speed, ambient temperature, or warnings about road conditions (such as ice or road



restrictions).

Figure 1 - Types of traffic lights with countdown timer display integrated into the yellow signal section of the traffic light. [URL: http://www.atilos.com.ua/uk/sredstva-upravleniya-dvizheniem/svetofory.html]

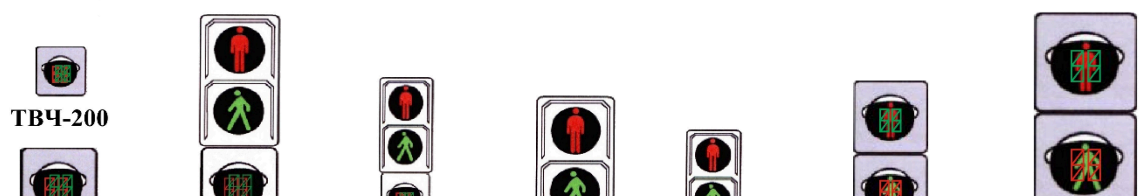


Figure 2 - Types of pedestrian traffic lights with countdown timer display
[URL: http://www.atilos.com.ua/uk/sredstva-upravleniya-dvizheniem/svetofory.html]

The countdown timer display should show signs or numbers from 99 to 01 in red or green color, depending on the duration of the corresponding signal.

The countdown timer display can be integrated into the yellow signal section of the traffic light provided it does not affect the specified characteristics of the yellow signal section as defined by the standard.

The countdown timer display is placed above the red signal section of the traffic light in the case of vertical arrangement of the traffic signals and to the left of the red signal section of the traffic light in the case of horizontal arrangement of the traffic signals, except in the case of integrating the countdown timer display into the yellow signal section of the traffic light [4].

These types of traffic lights with countdown timer displays can be used in various urban and road conditions depending on safety and traffic management requirements [5].

While traffic lights with countdown timer displays can be beneficial for optimizing traffic flow on roads, it is important to consider their potential negative consequences and develop strategies to mitigate these issues.

Traffic lights with countdown timer displays have their advantages as well as potential negative aspects.

Figure 3 - Traffic lights for vehicles and pedestrians with countdown timer displays
[URL: http://www.atilos.com.ua/uk/sredstva-upravleniya-dvizheniem/svetofory.html]

Benefits include:

1.Improved safety. One of the key aspects of road safety is predictability. Drivers can more accurately assess the time until the signal changes and take appropriate actions to adhere to traffic rules and avoid accidents.

2. Increased traffic efficiency. Information about the remaining time can help drivers plan their actions on the road, reducing congestion and increasing the flow of traffic.

3. Reducing stress. By knowing the exact time until the signal changes, drivers can better plan their movements and avoid the need for sudden braking or acceleration.

4. Traffic optimization. These traffic lights contribute to a smoother flow of traffic, as drivers can adapt their speed to the upcoming signal change. By knowing how much time is left until the signal changes, drivers can adjust their speed and timing, helping to smooth out traffic fluctuations and improve road capacity.

5. Enhancing driver experience. Countdown timer displays for traffic lights provide drivers with more information about road conditions, helping them better understand current circumstances and make more informed decisions behind the wheel.

6. Reduction of emissions. The increased efficiency of traffic flow facilitated by countdown timer displays for traffic lights can also lead to a decrease in vehicle emissions by reducing idle time at traffic lights. Smoother vehicle movement contributes to a reduction in exhaust gas emissions, thereby improving the environmental situation in cities.

These traffic lights represent one of the innovative steps in the field of traffic management that can help improve overall road safety and efficiency.

While the implementation of innovations on roads, such as countdown timer displays for traffic lights, offers numerous benefits, it also faces numerous problems and limitations that require careful analysis and solution.

Negative aspects may include:

1. Dependency on technology reliability: Traffic lights with countdown timer displays require a more complex technical infrastructure, increasing the risk of

malfunctions and failures, which can cause additional problems on the roads. Reliable technical systems are necessary for the proper operation of countdown timer displays. Malfunctions in these systems can lead to unreliable information for drivers and create additional road problems. Additionally, when daily programs are turned on or switched, there is a correction operation of the cycle of operation on the traffic light object, which may result in incorrect display of the countdown timer during few initial cycles.

2. Distraction: For some drivers, countdown timer displays can become a source of distraction, especially if they are trying to estimate the remaining time until the signal changes instead of focusing on the road conditions.

3. Risk of potential speeding: There is a danger that drivers may become reliant on the remaining time until the signal changes and increase their speed to make it through the intersection. This can increase the risk of accidents and traffic violations.

4. Unfamiliarity for drivers: One of the main challenges in implementing countdown timer displays for traffic lights is the unfamiliarity for drivers. Drivers accustomed to traditional traffic signals may have difficulty understanding and adapting to the new timer display system. This can lead to distrust of the information on the display and unexpected maneuvers on the roads.

5. Negative effect on pedestrians: Long countdown timer displays on traffic light panels can attract the attention of drivers and distract them from pedestrians who may be crossing the road, creating dangerous situations for pedestrian safety.

6. Inaccessibility for pedestrians and cyclists: In some cases, countdown timer displays on traffic lights may be inaccessible to pedestrians and cyclists due to their location or the absence of appropriate devices for displaying information. This can create additional challenges for safe road crossing.

7. Lack of universal understanding: Some drivers may struggle to understand the displayed information on countdown timer displays, especially if they are not familiar with this technology, which can lead to confusion and unpredictability on the road.

8. Increased stress for drivers: Countdown timer displays for traffic lights can increase stress for drivers, especially if they see that the time until the signal changes is rapidly decreasing and there is no opportunity to make timely decisions about their

actions. This can lead to aggressive behavior on the roads and an increased risk of road incidents.

Therefore, traffic lights with countdown timer displays have both positive and negative aspects, and their effectiveness depends on proper implementation and management.

While countdown timer displays for traffic lights are designed to enhance safety and efficiency of road traffic, sometimes they can be the cause or a contributing factor to road incidents. Below are some possible scenarios in which the countdown timer display for traffic lights may lead to events:

1. Desire to run a red light: A driver who sees the remaining time on the countdown timer may decide to take a risk and run a red light, especially if they see that the time until the signal changes is decreasing rapidly. This can lead to collisions with other vehicles or pedestrians crossing the road.

2. Increase in road aggression: If drivers feel time pressure when they see that the remaining time on the countdown timer is quickly decreasing, it can increase their aggressive behavior on the road. This can lead to dangerous maneuvers, sudden braking, or lane changes, which in turn can cause road accidents.

3. Dependency on technical malfunctions: If the technical systems responsible for the operation of the countdown timer display experience malfunctions or failures, it can lead to inaccurate information for drivers. For example, incorrect display of the time remaining until the signal changes can mislead drivers and become the cause of unforeseen situations on the road.

4. Driver distraction: Some drivers may become too focused on the countdown timer display, trying to determine if they will make it through the intersection before the signal changes. This can distract their attention from other aspects of road traffic, such as pedestrians, other vehicles, or road signs, increasing the risk of incidents.

Therefore, while countdown timer displays for traffic lights have the potential to enhance safety and efficiency of road traffic, it's important to understand the potential risks and take measures to minimize them. This includes educating drivers, developing adequate technical support, and continuously monitoring the system's operation to prevent possible negative consequences.

In conclusion, while countdown timer displays for traffic lights have the potential to improve safety and efficiency of road traffic, their implementation requires careful consideration of the aforementioned issues and the development of appropriate measures to address them. It is important to balance the potential benefits of this technology with its potential disadvantages to ensure the safety of all road users.

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COMPARATIVE ANALYSIS OF THE TRANSPORT FLOWS INTENSITY IN KHARKIV BEFORE AND AFTER 2022.

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The organization of traffic means a set of scientific, engineering and organizational measures that ensure the necessary level of efficiency and safety of traffic and pedestrian traffic [1]. Road traffic is characterized by the following parameters: