SMART PPE TO PREVENT HEAT STRESS

Q&A With Heidi Lehmann, Kenzen

Smart PPE can be used to provide real-time information to OSH professionals and employers to protect against many workplace hazards. *PSJ* spoke with Heidi Lehmann, cofounder of Kenzen, a smart PPE manufacturer, about how this technology can be used to help prevent heat-related injuries and fatalities.

Heidi E. Lehmann
Heidi E. Lehmann is chief commercial officer and cofounder of Kenzen, a smart PPE innovator focused on physiological monitoring and the prevention of heat injury and death among workers. Lehmann is a mobile technology entrepreneur in the connected devices/wearable products, mobile platforms and distributed media arena.

PSJ: Please give readers a brief overview of how smart PPE works.

Heidi: Traditional PPE might be a helmet so a falling rock doesn't hurt your head when you're doing construction, gloves so you can handle hot objects or a smock so chemicals don't spill on you. If you add to that sensors, cloud connectivity and the delivery of real-time safety information, then it becomes smart PPE. It's internet-enabled with sensors that pick up different signals, either from the environment or from the person. The information is transmitted to the cloud, then delivered back to the individual or a safety manager who can act on that information.

PSJ: Describe how this technology might be implemented on a work site. How is this different from traditional PPE?

Heidi: Typically, smart PPE is used as part of a broader category called the Industrial Internet of Things, which can also include machines, grids and efficiencies in the work site. But smart PPE, relates specifically to the worker. One could argue that the most prized component of any work site is the human factor, so it's keeping the worker safe. Examples of smart PPE might be augmented-reality glasses, which can, for example, help you see the inside of a mine so you could understand what logistics might be or what your next step is, or it could just help you see the whole environment in a different way for safety. Another example might be an exoskeleton suit, which would ensure that a worker is maintaining a safe posture at all times. There is smart PPE that relates to slips, trips and falls, which can tell through motion if a worker is doing something that could lead to a fall. What Kenzen does is physiological monitoring, which indicates small nuances within the individual physiology that can tell if a worker is about to experience some kind of an injury such as heat illness, fatigue or even fever.

PSJ: What differences might workers, supervisors, and managers experience with and without the use of smart PPE during an incident?

Heidi: Standard PPE is all about keeping people safer if an incident happens. Smart PPE has focused the attention more from incidents to near hits. The technology is able to detect things so you can avoid them before they happen. In our case, we are looking at core body temperature. What we do is we understand what the baseline core body temperature is for a specific individual. If we see that they're calibrating in a direction that is going beyond what is a normal range for them for core body temperature, they would get an alert to stop working and sit down. Then they'd get another alert when it is safe to go back to work. So this prevents a heat injury on site. Heat injuries are preventable, but they are very difficult to detect until it's too late. In our case, the sensors are measuring the physiology, and they would help the worker see in advance that they are at risk for a heat injury and that they should stop working.

A worker who is in the middle of a job or doesn't want to sit down at the moment might dismiss the alert or might not even see it. But the safety manager, in our case, would have the web-based tablet and would see the entire workforce. The safety manager would understand that a worker was at risk for a heat-related injury, and could intervene. And later on, the employer would see the trends from different physiological sensors and could look retrospectively. They could see, for example, that many workers were suffering heat injuries at a particular time of day on a particular site, and could determine what to do to make the site more safe.

PSJ: So it's not just intervening in the moment, but also collecting data that tells you a bit more about when incidents are more likely to occur or not.

Heidi: That's exactly right. We have an entire platform that is all about physiological monitoring. The front end of that platform is like a patch worn on the upper arm. That data collection piece is sampling, through sensors, the worker's physiology every 5 seconds, gathering about 1.3 million data points per day per worker. Then it sends that information, either to the worker's phone and then to the cloud in 0.05 seconds. We then have machine learning and insights that are created within the cloud, and it delivers the information to the worker, and the safety manager and then later for corporate EHS. It quickly can gather data based on sensing the physiology or the environment or whatever the sensors are picking up, and make that information an insight that someone can act on. A lot of the magic is not just the sensors, but the algorithms created from all that information to provide an actionable step that the worker can take.

What we found is that the safety manager has become key in the intervention part of it. We have found a couple of things with workers: they often will get an alert but they want to keep on working because they want to get the job done. Another thing is, especially if they're working construction or in a warehouse where they're part of a team,

it's difficult for a worker say, "Hey, guys, I just got an alert. I'm going to sit down and be in the shade and have a cold drink while you're working." That's hard to do. The safety manager really plays a key role. They can then step in and say, "Hey, why don't you take five." They will also know from the sensors when the core body temperature has normalized so that individual can rejoin the team and go back to work.

PSJ: What factors are driving the use of smart PPE in workplaces?

Heidi: There are three: safety, productivity and cost to the company. The first is just safety, keeping the workers and work site safe. It started in the consumer space with fitness trackers with sensors that detect heart rate and steps. This technology got a lot of individuals thinking about being able to quantify their health, keeping healthy by detecting things before they happen. On work sites there are other things using sensors, such as gas detection, physiological monitoring or noise detection. Keeping the worker safe and healthy is the number one thing. The second thing is productivity. If a worker is healthier, in our case, taking the proper breaks and making sure you're staying safe from heat and other things, you're going to be a more productive worker. You're going to do the job better and more efficiently, and even ideally faster if you're safer and healthier. The third thing is cost to the company. If a worker is more fit for duty, and there are fewer days away from work and less hospitalization, that's going to drive down all sorts of health-related costs that can be experienced through injury and illness. Anything to get that in line a little bit more, and make the workers optimize for health if possible, I think everybody benefits.

PSJ: How are companies leveraging new technologies to build better smart PPE?

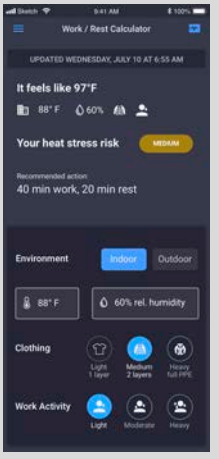
Heidi: First, form factors are getting better and smaller. The miniaturization of components is going to allow that the form factor itself is a little bit more elegant and a little bit less obtrusive to the worker. As Kenzen is performing its pilots across work sites, one of the first measurements is whether a worker will accept this form factor. Because if they don't like it, if it's uncomfortable or if they feel that it intrudes on their workday, they're not going to want to wear it. They're still going to have traditional PPE. Anything additional has to be imperceptible. It has to go on easily within 5 seconds. Also battery life is getting longer. Most smart PPE has to charge; it's not going to run indefinitely. The processing speed has gotten faster. All the things that are happening with computers, the internet and the cloud, including the form factor, that's all gotten more efficient. And there is more data that we are taking advantage of. The more data we have, the better our algorithms can become. We can predict and prevent injury with more precision. The more data we get, the more we learn and the more everyone benefits.

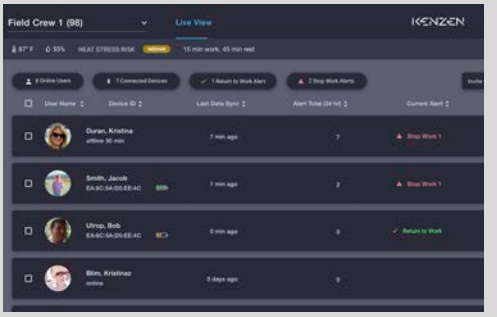
PSJ: What trends might we see in the development of smart PPE in the future?

Heidi: Today we're looking at core body temperature, both exertional heat and fever. Eventually, we will be looking at fatigue and cold and many other things. Someone's working on a fall detection device. Can they get more precise before someone is climbing, do they have to be at a slightly different angle to avoid a fall? I think there's going to be a lot more precision to optimize. I think you're going to see more connected platforms where there will be a feed of our information. Then you name the other smart PPE data sources, gas detection, sound detection, fall detection. Safety managers will have one place to look at everything. **PSJ**

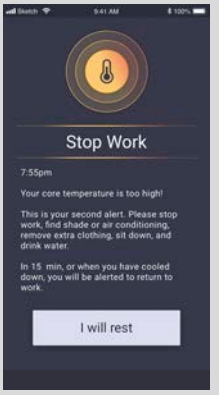
SMART PPE EXAMPLE

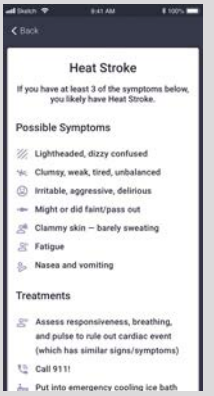
Smart PPE is worn by workers at the jobsite to provide real-time insight into physiological status. These wearables may collect data, adjust to conditions and warn of hazards. Algorithms created from that information provide an actional step for workers to take and allows an OSH professional to intervene when an injury or incident may occur.





A dashboard may provide information to both the OSH professional and to the worker, often on a phone or tablet. In this case, an app provides information about heat risk to workers, including the temperature, humidity and real-feel temperature.





The smart PPE provides an alert to workers to stop work when core temperature is too high. It recommends finding shade or air conditioning, remove extra clothing, sit down and drink water. It advises when to return to work based on physiological factors. The app details the symptoms of life-threatening issues such as heat stroke so that workers can self-assess their health status.