iBOS® Charger-Splitter™
Half the Chargers, Half the Cost

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Philadelphia Scientific®
industrial battery innovation

Executive Summary

In a 2017 study of the utilization of industrial chargers in a material handling (forklift truck) environment, Philadelphia Scientific found that the average battery charger is only used 22% of the time; a waste of costly resources. The addition of an iBOS® battery room management system, the industry's most widely used battery management system, and the new iBOS® Charger-Splitter™ enables battery rooms to use half the chargers they are currently using – at half the cost. When installed onto a conventional charging system, the Charger-Splitter enables forklift operators to sequentially charge two batteries with one charger. As a result, companies can realize significant savings by purchasing fewer chargers and using less AC power infrastructure in the battery room.

Combining the iBOS system and iBOS Charger-Splitters has proven to be a successful cost-saving strategy in industrial battery rooms since 2013. While some skeptics believe that operators will not readily implement this new battery charging strategy or will not charge batteries in a timely fashion, the results of 28 test warehouses across the country provide proof that significant savings can be consistently and efficiently achieved by combining iBOS and the iBOS Charger-Splitter.

Buying half the number of chargers can save companies with any size battery room significant expense, with larger sites having the greatest savings potential. Any site with 20 chargers or more will find that using the iBOS Charger-Splitter and an iBOS battery room management system will be less costly than buying one charger for every battery slot. This analysis holds true for…

- a new battery room;
- applications where there is a seasonal use of rental batteries; the site can leave open positions next to current batteries and add batteries when needed without the need to install additional power;
- Greenfield sites and full renovation sites, which will require only half the chargers they would typically need.

Doing the Math

For the sake of establishing a common benchmark, let's assume that the average cost of a charger is $2,500 (representing the average costs of different sized chargers) and includes $300 for the cost of installation and junction boxes. This cost does not include the cost of running the AC electric supply to the battery room.

For each charger eliminated, a set of extension cables and a Charger-Splitter bracket must be added. The cost of this hardware and the cost of installing it is estimated to be $510. That means the net savings are about $2,000 for every Charger-Splitter installed. For example, a site that would traditionally use 50 chargers could now use 25 chargers with 25 Charger-Splitters and would see a cost reduction of $50,000. This scenario provides the hardware to supply charging current to each rack location but does not include the cost of the iBOS battery room management system that will be needed to operate it.

However, in sites with at least 20 rack locations, the savings from using iBOS Charger-Splitters will pay for the cost of an iBOS battery room management system, which has been proven to maximize battery run times and battery life while enabling the right-sizing of battery fleets. Using the example above, the list price for a 50-charger iBOS system will be approximately $25,000. The cost savings from buying fewer chargers will pay for an iBOS system and still be $25,000 less expensive than putting in a traditional charging system without a battery room management system.

Here are the estimated cost savings for varying system sizes:

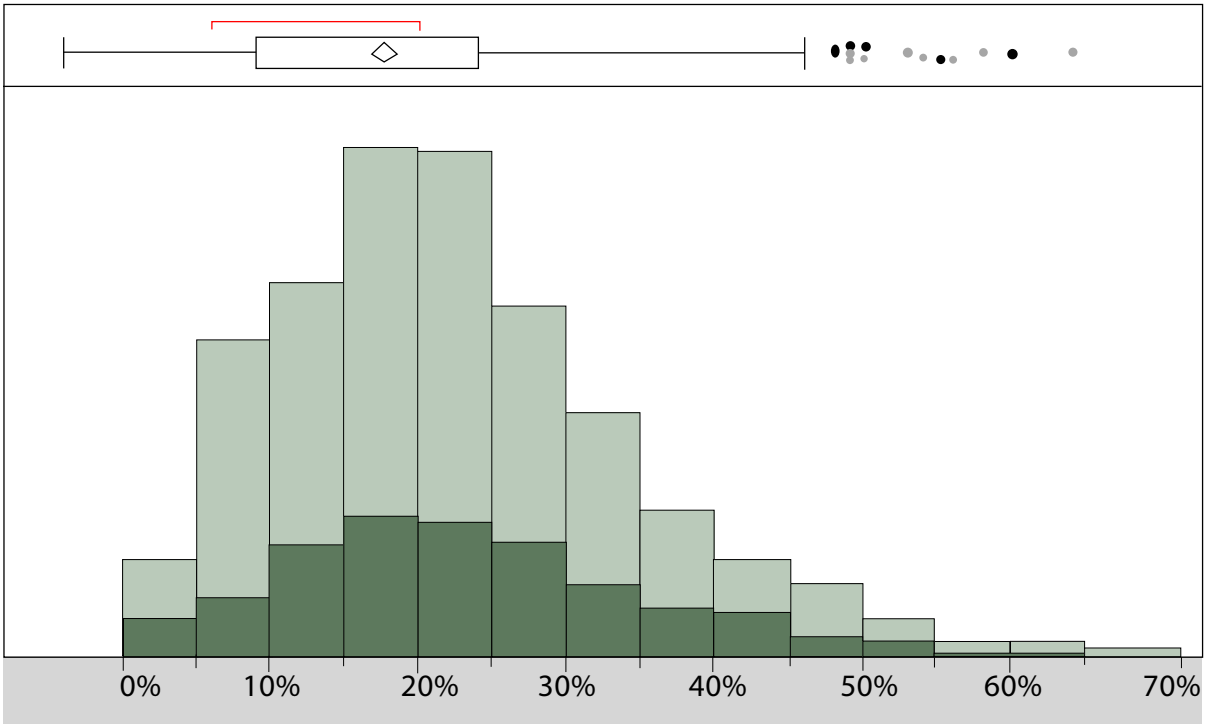
Charging Positions	iBOS, Splitter, Half The Chargers	Chargers Only	Savings*
20	$45,635	$ 49,830	$ 4,195
50	$98,358	$124,575	$26,218
100	$190,775	$249,150	$58,375
200	$381,000	$498,300	$117,300
350	$654,183	$872,025	$217,843

* Note that these savings are after paying for the iBOS battery room management system. Essentially, the user is getting a free iBOS system in addition to these savings.

Charger Utilization

Most battery room managers surveyed believe that their chargers are active and charging batteries at least 33% of the time. Many believe it to be closer to 50% since the battery gets charged in 8 hours and then can, ideally, cool for 8 hours before being picked.

Philadelphia Scientific conducted a study using data collected by battery room management systems used to monitor chargers. 19,300 chargers at 357 sites were used for this analysis. The following usage level was cited at these sites. (The darker and lighter bars in the chart represent different regions in the world, demonstrating that this data is representative worldwide.)



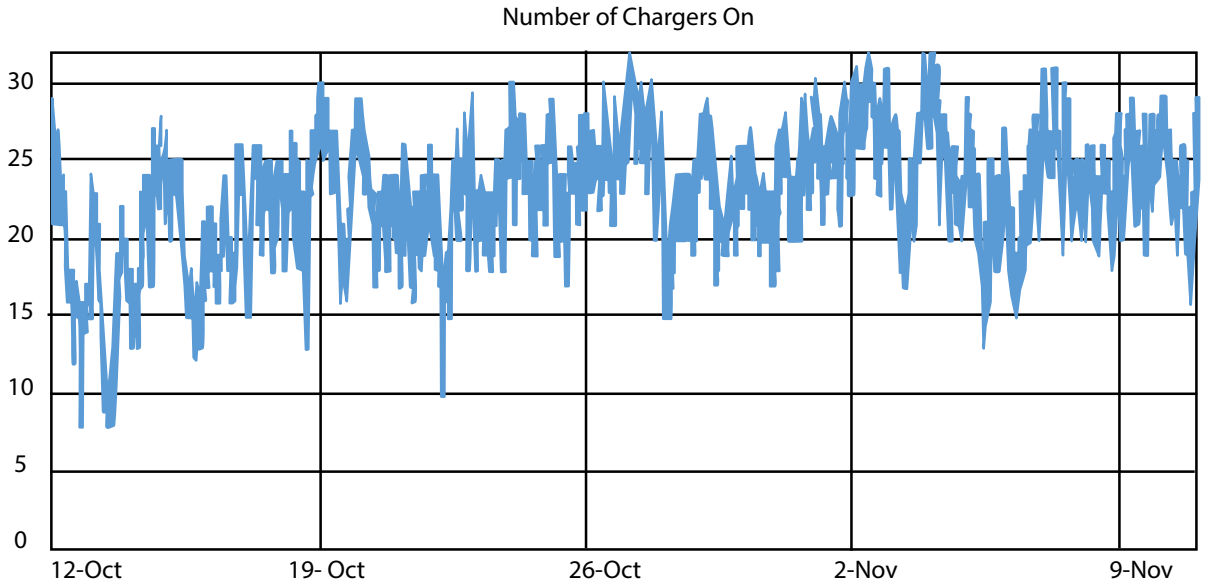
Note that…

- Only 2% of sites had charger usage over 50%.
- Only 14% of sites had charger usage over 33%.

The sites where the chargers were being used with the highest intensity were thought to be operating with too few batteries. These sites were not functioning well, often running out of batteries. It was very rare for these sites to get 8 hours of optimal cool-down time. When the chargers had utilization over 33%, they only experienced an 8-hour cool-down 30% of the time.

This data shows the overall charger utilization at a variety of sites. But, one concern was that there were times during the day when more chargers than average were needed. To address this concern, Philadelphia Scientific tested Charger-Splitters at a site with high charger utilization: a charger group with 32 chargers and 64 charging positions for batteries. If this utilization had been implemented in a traditional way (i.e., one charger per position), there would be 64 chargers that would be utilized 34% of the time. Since there were only half as many chargers, this pool utilized its chargers 68% of the time. But, since each charger had 2 battery locations associated with it, the batteries had time to cool – even while charger utilization was higher than was typical when not using Charger-Splitters.

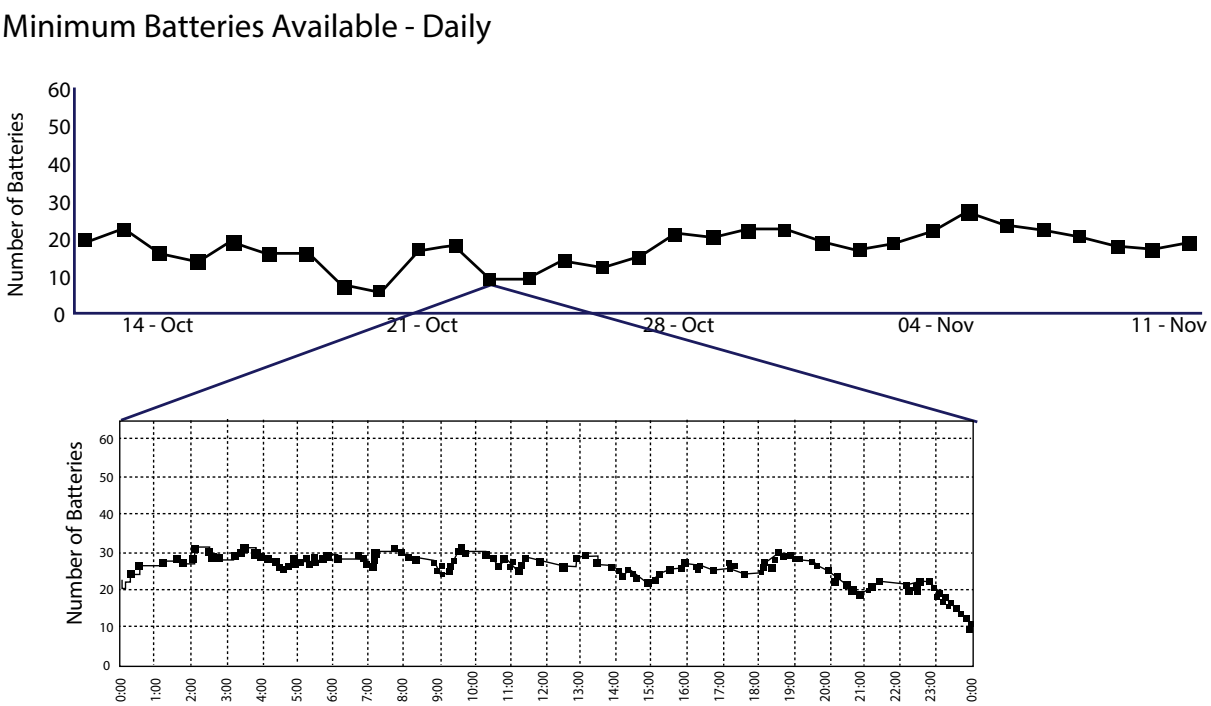
The following graph (Number of Chargers On) over a 30-day period shows how many chargers were on at any one time. On 4 occasions all 32 chargers were on. This site had Charger-Splitters on all the chargers, so it was supporting 64 batteries on the rack.



The average number of chargers on at the same time was 23 out of 32 chargers – approximately 72% of all chargers. The total amount of time when all 32 chargers were on at the same time was 58 minutes, which is about 0.13% of the time. This shows that Charger-Splitters don't negatively impact peak charging capability.

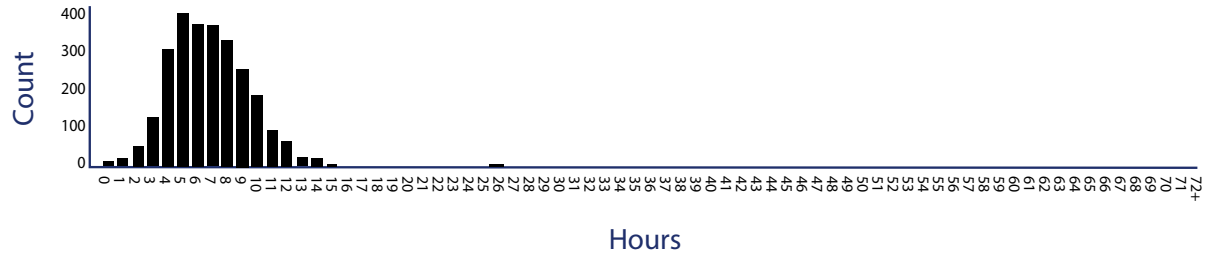
Battery room personnel often think they can only work successfully in light duty applications when the batteries are not used much; otherwise, more batteries will need to be purchased. But, availability statistics show that such sites do not run out of batteries. Instead, such sites are using the fleet "hard" and do not have an excessive number of batteries. Batteries are being delivered to the trucks when they need them.

(Minimum Batteries Available – Daily) This is a site that uses its batteries heavily with 6 cycles per week per



battery. The site is running well, but it would benefit from having more batteries to get better cool-down times and improve battery life. In 62% of the charge cycles the batteries are getting less than 8 hours of cool-down.

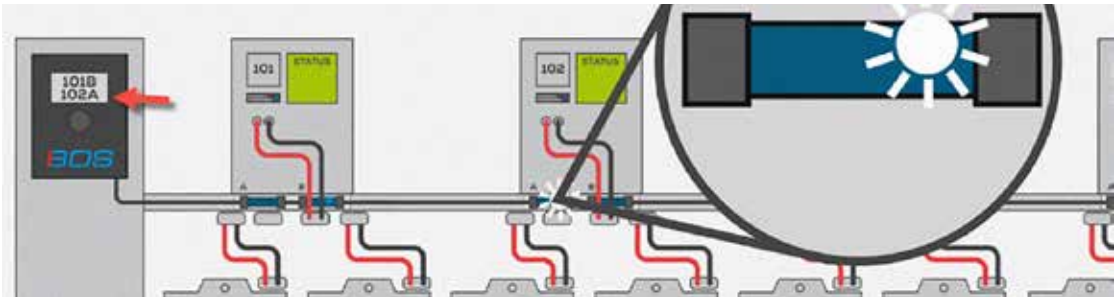
Cool Down Time



(Cool Down Time) This is a well-running site that is utilizing its batteries extremely hard (86% of charger pools are less busy than this one). This reinforces the fact that most sites can easily get double the usage of their chargers and still have adequate capacity.

How to Use iBOS Charger-Splitters

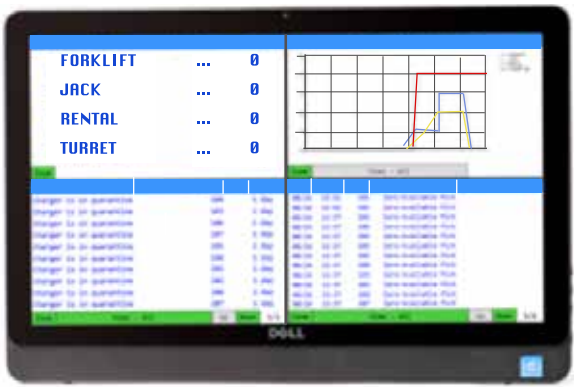
Philadelphia Scientific's experience with 28 locations shows that battery room personnel – with the feedback from the iBOS system's performance reporting – can easily and efficiently operate the iBOS battery management system with iBOS Charger-Splitters. Here is a brief explanation of the procedures they will follow. This image shows a sample installation.



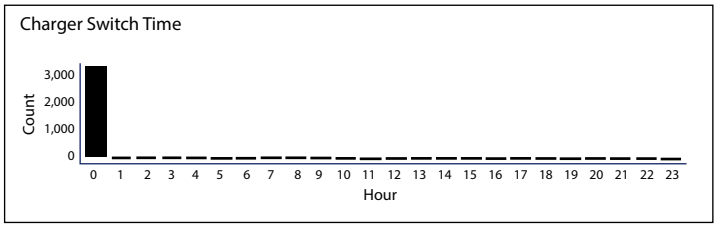
Every slot for a battery has a connector where the battery can be plugged in. A battery change is as easy as with a traditional charging application: every battery slot on the rack has its own connector – so, when operators change a battery they take the charged and cooled battery out of one slot, put the discharged battery back in the slot and plug it into the connector.

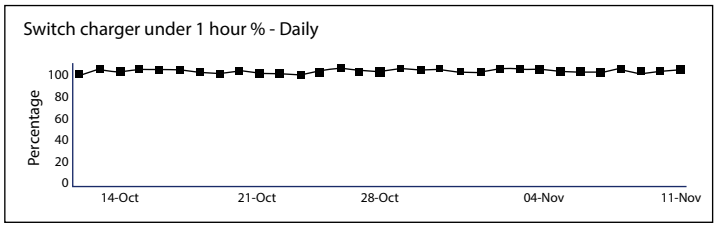
In addition to the connectors for the batteries, there are two connectors mounted near each charger. The charger can be plugged into one of these connectors. The connector selected will determine which of the two battery slots gets connected to the charger. If the charger cable needs to be switched over from one connector to the other, a white light will start to flash. This light is visible from a long distance and will alert operators that the cable should be unplugged from one connector and plugged into the other. When this action is taken, the light will go out and the charger will start charging the battery in the other slot.

To keep personnel outside the battery room informed of the need to switch charger cables, an optional iBOS® Operations Display touchscreen computer can be mounted anywhere in the facility (e.g., in the office of the maintenance manager or in the maintenance area where the mechanics work). This touchscreen has a "to do" list, and if any chargers need to be switched over, that information will appear on the list. Combined, the white light and the computer screen help to ensure that all warehouse personnel – operators, maintenance managers and mechanics – are accountable.



Finally, a report on the iBOSWorld website tracks whether operators are actually switching the chargers when they are directed to do so.





Summary - All Pools

99%	Switch time under 1 hour
00:06	Average Time to switch (hh:mm)
3,816	Total number of switches
1	Number of missed switch opportunities
31	Days in Summary (12 Oct 2017 - 11 Nov 2017

In conclusion, the iBOS battery room management system and iBOS Charger-Splitters save significant expense in nearly any size battery room and make the job of managing battery and charger fleets by giving management the feedback tools they need.

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