



**THOMPSON & JOHNSON**  
EQUIPMENT CO., INC.

## The Forklift Corner

### Battery Recycling

#### LEAD ACID BATTERY SCRAP RECYCLING

RECYCLING BY DEFINITION IS THE REUSE OF MATERIALS, EITHER PRE-CONSUMER OR POST-CONSUMER, THAT WOULD ORDINARILY BE CONSIDERED WASTE. RECYCLING HELPS LESSEN THE AMOUNT OF WASTE THAT GOES INTO LANDFILLS, HELPS REDUCE THE AMOUNT OF TOXIC CHEMICALS ABSORBED INTO THE EARTH AND, IN SOME CASES, SIGNIFICANTLY REDUCES MANUFACTURING COSTS AND ENERGY CONSUMPTION.

BATTERY RECYCLING IS GOOD FOR THE EARTH AND GOOD FOR FUTURE GENERATIONS. BATTERY RECYCLING IS THE ACT OF PROCESSING USED OR ABANDONED BATTERIES, WHICH WOULD OTHERWISE BE CONSIDERED WASTE AND HARMFUL TO OUR ENVIRONMENT. MANY COMMUNITIES HAVE CURBSIDE BATTERY RECYCLING SERVICES TO HELP OUT AND THERE ARE BATTERY RECYCLING CENTERS ALL ACROSS THE COUNTRY WHERE SPENT BATTERY CAN BE BROUGHT. OFTEN TIMES BATTERY RECYCLING CENTERS PAY YOU FOR DROPPING SPENT BATTERY OFF, SO IT'S A WIN-WIN SITUATION.

THERE ARE MANY MISCONCEPTIONS ABOUT WHAT MATERIALS CAN AND CANNOT BE RECYCLED. THESE MISCONCEPTIONS HINDER THE SUCCESS AND COST-EFFICIENCY OF RECYCLING PROGRAMS WORLDWIDE. HOWEVER, WITH A LITTLE CONSUMER EDUCATION, RECYCLING CAN BE A VERY IMPORTANT AND ENVIRONMENTALLY SOUND SOLUTION TO WASTE MANAGEMENT.

#### LEAD ACID BATTERY SCRAP PROCESSING

MODERN BATTERIES ARE OFTEN PROMOTED ON THEIR ENVIRONMENTAL QUALITIES. LITHIUM-BASED BATTERIES FALL INTO THIS CATEGORY. WHILE NICKEL-CADMIUM PRESENTS AN ENVIRONMENTAL PROBLEM ON CARELESS DISPOSAL, THIS CHEMISTRY CONTINUES TO HOLD AN IMPORTANT POSITION AMONG RECHARGEABLE BATTERIES. POWER TOOLS ARE ALMOST EXCLUSIVELY POWERED BY NICKEL-CADMIUM. LEAD-ACID BATTERIES CONTINUE TO SERVICE DESIGNATED MARKET NICHEs AND THESE BATTERIES ALSO NEED TO BE DISPOSED OF IN A PROPER MANNER. LITHIUM-ION WOULD SIMPLY BE TOO FRAGILE TO REPLACE MANY OF THESE OLDER, BUT ENVIRONMENTALLY UNFRIENDLY, BATTERY CHEMISTRIES. THE LEAD-ACID BATTERY HAS LED THE WAY IN RECYCLING. THE AUTOMOTIVE INDUSTRY SHOULD BE GIVEN CREDIT IN ORGANIZING WAYS TO DISPOSE OF SPENT CAR BATTERIES. IN THE USA, 98% OF ALL LEAD ACID BATTERIES ARE RECYCLED. IN COMPARISON, ONLY ONE IN SIX HOUSEHOLDS IN NORTH AMERICA RECYCLES BATTERIES.

#### BATTERY RECYCLING PROCESS

ALTHOUGH NICKEL-METAL-HYDRIDE IS CONSIDERED ENVIRONMENTALLY FRIENDLY, THIS CHEMISTRY IS ALSO BEING RECYCLED. THE MAIN DERIVATIVE IS NICKEL, WHICH IS CONSIDERED SEMI-TOXIC. NICKEL-METAL-HYDRIDE ALSO CONTAINS ELECTROLYTE THAT, IN LARGE AMOUNTS, IS HAZARDOUS.

MOST LITHIUM BATTERIES ARE NON-RECHARGEABLE AND ARE USED IN CAMERAS, HEARING AIDS AND DEFENSE APPLICATIONS. FOR PROPER DISPOSAL, THE BATTERIES MUST FIRST BE FULLY DISCHARGED TO CONSUME THE METALLIC LITHIUM CONTENT.

#### BATTERY RECYCLING PLANT

BATTERY RECYCLING PLANT REQUIRE THAT THE BATTERIES BE SORTED ACCORDING TO CHEMISTRIES. SOME SORTING MUST BE DONE PRIOR TO THE BATTERY ARRIVING AT THE RECYCLING PLANT. NICKEL-CADMIUM, NICKEL-METAL-HYDRIDE, LITHIUM-ION AND LEAD ACID ARE PLACED IN DESIGNATED BOXES AT THE COLLECTION POINT. BATTERY RECYCLERS CLAIM THAT IF A STEADY STREAM OF BATTERIES, SORTED BY CHEMISTRY, WERE AVAILABLE AT NO CHARGE, RECYCLING WOULD BE PROFITABLE. BUT PREPARATION AND TRANSPORTATION ADD TO THE COST.

THE RECYCLING PROCESS STARTS BY REMOVING THE COMBUSTIBLE MATERIAL, SUCH AS PLASTICS AND INSULATION, WITH A GAS FIRED THERMAL OXIDIZER. GASES FROM THE THERMAL OXIDIZER ARE SENT TO THE PLANT'S SCRUBBER WHERE THEY ARE NEUTRALIZED TO REMOVE POLLUTANTS. THE PROCESS LEAVES THE CLEAN, NAKED CELLS, WHICH CONTAIN VALUABLE METAL CONTENT.

THE CELLS ARE THEN CHOPPED INTO SMALL PIECES, WHICH ARE HEATED UNTIL THE METAL LIQUEFIES. NON-METALLIC SUBSTANCES ARE BURNED OFF; LEAVING A BLACK SLAG ON TOP THAT IS REMOVED WITH A SLAG ARM. THE DIFFERENT ALLOYS SETTLE ACCORDING TO THEIR WEIGHTS AND ARE SKIMMED OFF LIKE CREAM FROM RAW MILK.

CADMIUM IS RELATIVELY LIGHT AND VAPORIZES AT HIGH TEMPERATURES. IN A PROCESS THAT APPEARS LIKE A PAN BOILING OVER, A FAN BLOWS THE CADMIUM VAPOR INTO A LARGE TUBE, WHICH IS COOLED WITH WATER MIST. THIS CAUSES THE VAPORS TO CONDENSE AND PRODUCES CADMIUM THAT IS 99.95 PERCENT PURE.

CURRENT BATTERY RECYCLING METHODS REQUIRES A HIGH AMOUNT OF ENERGY. IT TAKES SIX TO TEN TIMES THE AMOUNT OF ENERGY TO RECLAIM METALS FROM RECYCLED BATTERIES THAN IT WOULD THROUGH OTHER MEANS.

BATTERIES CONTAIN A RANGE OF METALS WHICH CAN BE REUSED AS A SECONDARY RAW MATERIAL. THERE ARE WELL-ESTABLISHED METHODS FOR THE RECYCLING OF MOST BATTERIES CONTAINING LEAD, NICKEL-CADMIUM, NICKEL HYDRIDE AND MERCURY. FOR SOME, SUCH AS NEWER NICKEL-HYDRIDE AND LITHIUM SYSTEMS, RECYCLING IS STILL IN THE EARLY STAGES.

THERE ARE A NUMBER OF DIFFERENT BATTERY RECYCLING PROCESSES, WHICH ARE AIMED AT RECOVERING A VARIETY OF MATERIALS:

**LEAD** CAN BE RECOVERED BY EITHER SEPARATING THE DIFFERENT MATERIALS THAT MAKE UP THE BATTERY (LEAD, PLASTICS, ACID, ETC.) PRIOR TO METALLURGICAL PROCESSING. ALTERNATIVELY, BATTERIES CAN BE PROCESSED AS A WHOLE THROUGH HEAT TREATMENT IN A PARTICULAR TYPE OF FURNACE WITH METALS BEING RECOVERED AT THE END OF HIS PROCESS.

**NiCd BATTERIES** CAN BE REPROCESSED THROUGH A SIMILAR THERMAL TECHNIQUE, WHICH RECOVERS CADMIUM AND IRON-NICKEL FOR STEEL PRODUCTION.

BATTERIES CONTAINING **MERCURY (BUTTON CELLS)** ARE MOST COMMONLY PROCESSED USING A VACUUM-THERMAL TREATMENT, IN WHICH THE MERCURY VAPORIZES. IT CONDENSES AND EVENTUALLY SOLIDIFIES WHEN TEMPERATURES ARE REDUCED AND CAN THEN BE REINTRODUCED INTO THE MATERIAL CYCLE. NiMH BATTERIES ARE REPROCESSED BY MECHANICALLY SEPARATING THE INDIVIDUAL MATERIALS (PLASTIC, HYDROGEN AND NICKEL) WITHIN A VACUUM CHAMBER TO PREVENT THE ESCAPE OF HYDROGEN. THE OUTPUT OF THIS PROCESS IS A PRODUCT WITH HIGH NICKEL CONTENT WHICH CAN BE USED IN THE MANUFACTURE OF STAINLESS STEEL.

LI-ION BATTERIES ARE CURRENTLY REPROCESSED THROUGH PYROLYSIS (HEAT TREATMENT) WITH THE PRIMARY RECOVERY THE METAL CONTENT. ZINC-CARBON/AIR AND ALKALINE-MANGANESE BATTERIES CAN BE REPROCESSED USING A NUMBER OF DIFFERENT METHODS, WHICH INCLUDE SMELTING AND OTHER THERMAL-METALLURGICAL PROCESSES TO RECOVER THE METAL CONTENT (PARTICULARLY ZINC).

WANT TO KNOW MORE? GIVE OUR BATTERY SPECIALISTS A CALL TODAY OR FILL OUT A CONTACT FORM ONLINE [HERE](#).



FOR MORE INFORMATION  
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