Evolution of Design and Applications of Apron Feeders

Martin A. Yester - Senior Applications Engineer
Metso Minerals - Minerals Processing
Bulk Material Handling Division, Pgh., PA USA
Metso Minerals Apron Feeders

EVOLUTION of Design and Application

of an APRON FEEDER

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Metso Minerals Apron Feeders

What is an Apron Feeder?

An apron feeder is a mechanical feeder used to extract raw material typically from dump hoppers, bins and stockpiles.
WHY ARE APRON FEEDERS USED?

APRON FEEDERS ARE USED TO EXTRACT OR FEED MATERIALS...

♦ AT A SHORT DISTANCE
♦ AT A CONTROLLED RATE OF SPEED
♦ AT EXTREMELY SLOW SPEEDS

THE PURPOSE OF A SLOW CONTROLLED RATE OF SPEED (FEED) IS...

♦ TO PREVENT CHOKING OF MATERIAL FEEDING CRUSHERS AND OTHER EQUIPMENT.
♦ TO RECLAIM MATERIAL AT A UNIFORM RATE FROM HOPPERS, BINS & STOCKPILES.
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WHEN ARE APRON FEEDERS USED?

APRON FEEDERS ARE USED IN APPLICATIONS WHEN . . .

♦ THE NEED TO FEED LARGE LUMPS OF RAW ORE UNDER SEVERE IMPACT CONDITIONS.
(LUMP SIZES OF 60” (1500 mm) IS NOT UNUSUAL)

TRUCK DUMP HOPPER

DISCHARGE FROM AF
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APRON FEEDERS ARE USED

- WHEN MATERIAL IS WET, STICKY / CLAYISH OR LUMPY AND CAN NOT BE HANDLED BY OTHER EQUIPMENT OR FEEDERS.
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APRON FEEDERS ARE USED

♦ AS A BUFFER TO PROTECT DOWNSTREAM EQUIPMENT SUCH AS CONVEYORS, CRUSHERS, WOBBLER FEEDERS & VIBRATING GRIZZLIES.

- Feed to Mill
- Feed to Grizzly Feeder
- Feed to Crusher
- Discharge to Wobbler Feeder
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APRON FEEDERS ARE ALSO USED

- Present material handling operations are using apron feeders as secondary and tertiary feeders to insure reliable operation with very low maintenance and downtime.

Feeders under additive hoppers for the cement industry

Optional: weigh scale

Apron feeder under silos

Apron feeder under bins

Under storage bins
APRON FEEDERS ARE ENGINEERED & BUILT WITH A ROBUST DESIGN AND ATTENTION GIVEN TO MAINTENANCE & RELIABILITY FOR LONG TERM INDUSTRIAL TYPE OPERATION.

THE FOLLOWING TYPES OF FEEDERS ARE GENERALLY INSTALLED IN THE FOLLOWING APPLICATIONS

♦ LIGHT DUTY  ♦ NON - IMPACT
♦ NON - ABRASIVE  ♦ NON - STICKY

APRON FEEDERS (AF) SHOULD NOT BE MISTAKEN FOR . .
PAN FEEDERS AND CONVEYORS ARE SOMETIMES REFERRED TO AS APRON FEEDERS. HOWEVER, THEY ARE NOT THE INDUSTRY STANDARD FOR HEAVY DUTY APPLICATIONS.
APRON FEEDERS (AF) SHOULD NOT BE MISTAKEN FOR...

AF ≠

RECIPIROCATING (PLATE) FEEDER

AF ≠

VIBRATING FEEDER
APRON FEEDERS (AF) SHOULD NOT BE MISTAKEN FOR . . .

AF ≠

GRIZZLY FEEDER

AF ≠

BELT FEEDER
ALTHOUGH MORE EXPENSIVE THAN THE ABOVE MENTIONED TYPE OF FEEDERS, APRON FEEDERS ARE . . .

♦ MORE RELIABLE

♦ REQUIRE LESS MAINTENANCE

♦ REQUIRE LESS SPARE PARTS

♦ PROVIDE BETTER FEED CONTROL

ALL OF THESE SAVE OPERATORS MONEY IN THE LONG TERM.
WHERE ARE APRON FEEDERS USED?

APRON FEEDERS CAN BE USED AT ALMOST ANY BULK MATERIALS HANDLING OPERATION THAT REQUIRES FLOW CONTROL.

WHO USES APRON FEEDERS?

♦ LOADING & UNLOADING TERMINALS
♦ COAL FIRED POWER PLANTS
♦ MINERAL PROCESSING PLANTS
♦ OPEN PIT MINING
♦ QUARRIES OF ALL TYPES
♦ STRIP MINING OPERATIONS
♦ UNDERGROUND MINING OPERATIONS
♦ TRANS SHIPPING TERMINALS

SOME OF THE MOST COMMON INDUSTRIES ARE...

♦ GYPSUM ♦ COAL ♦ AGGREGATE
♦ COPPER ♦ GOLD ♦ CEMENT
♦ IRON ♦ BAUXITE
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APRON FEEDER PRINCIPLE
THREE (3) MAJOR APPLICATIONS

♦ PRIMARY FEEDERS - are used to control the feed of +60” X 0 Run of Mine materials to primary crushers or dump stations.

♦ SECONDARY FEEDERS - are used under crushers, hoppers & bins to act as a buffer to downstream equipment and to control surge of 12” X 0 material.

♦ TERTIARY FEEDERS - are typically utilized under silos and stockpiles to reclaim 10” X 0 materials from storage.
APRON FEEDERS CONSIST PRIMARLY OF TWO (2) STRANDS OF ENDLESS TRACTOR CHAIN WITH EITHER CAST MANGANESE OR FABRICATED STEEL PANS (FLIGHTS) BOLTED TO COMMON LINK OF EACH STRAND. THE CHAINS ARE DRIVEN BY SPROCKETS THAT ARE MOUNTED TO A HEAD SHAFT. THE PANS TRAVEL WITH THE CHAIN AND ARTICULATE OVER THE HEAD SPROCKETS TO DISCHARGE MATERIAL.
APRON FEEDERS OF THE PAST ARE SOMETIMES REFERRED TO AS . . .

♦ MANGANESE FEEDERS
♦ PAN FEEDERS (OUTBOARD CHAIN DESIGN)

FEEDERS OF THE PAST UTILIZED COMPONENTS THAT DO NOT MEET STANDARDS OF PRESENT DAY FEEDERS.

1. NON-LUBRICATED CHAIN (RIVITED FASTENED) ENGINEERED CLASS CHAIN WITH INTEGRAL ROLLERS
2. MANUAL LUBRICATED BABBITTED CARRY ROLLERS
3. ROLLERS MOUNTED TO COMMON SHAFT
4. RIVITED TYPE PANS OF 9”, 12” & 18” PITCH
5. ONE PIECE DRIVE SPROCKETS
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**FEEDERS OF THE PRESENT**

Should be referred to as “tractor type” apron feeders utilizing reputable manufactured tractor undercarriage components.

1. Tractor Chain of “Sealed for Life Lubrication”
2. Carry (Top) Rollers of “Sealed for Life Lubrication”
3. Return Rollers of “Sealed for Life Lubrication”
4. Tail Wheels of “Sealed for Life Lubrication”
5. Cast Manganese or Fabricated Steel Pans
6. Segmented Sprockets

This type of design is the standard for apron feeders and has been the proven supply for the bulk material handling industry.
APRON FEEDER UTILIZING TRACTOR COMPONENTS

DUE TO THE TRACTOR UNDERCARRIAGE COMPONENTS BEING “SEALED FOR LIFE” AND OF A HEAVY DUTY DESIGN, AN APRON FEEDER REQUIRES LESS . . .

♦ MAINTENANCE
♦ LUBRICATION
♦ WEAR

ALSO
♦ PARTS ARE MORE READILY AVAILABLE THAN THE OLDER TYPE DESIGNS.

$ ALL OF THESE REDUCE YOUR DOWNTIME & OPERATING COST ! $
Components of a "Tractor Type" Apron Feeder

- Carry Rollers
- Return Rollers
- Chain
- Drive Sprockets
- Pans (Flights)
- Tail Wheel

Typical Undercarriage of a Tractor Dozer or Excavator

Travel
1) PRIMARY DRIVE REDUCTION of the PAST

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SHAFT MOUNTED GEAR SET
REDUCER

BULL GEAR
PINION
OPEN SPUR GEARING

CHAIN DRIVE
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2) MAIN DRIVE SOURCE

♦ MECHANICAL - FIXED or VARIABLE SPEED
♦ HYDRAULIC - VARIABLE SPEED

of the PAST

of the PRESENT
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2) MAIN DRIVE SOURCE of the PRESENT

HYDRAULIC POWER UNIT

VARIABLE HYDRAULIC DRIVE

HYDRAULIC DRIVE w/ POWER UNIT

HYDRAULIC DRIVE w/ POWER UNIT
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3) HEAD SHAFT

PRECISION MACHINED & INSPECTED SHAFTS

PROPERLY DESIGNED TURNDOWNS, KEYWAYS & SAFETY FACTORS

HOT ROLLED SHAFTING. (C1045, C4140 OR C4340) FORGED STEEL SHAFTING OVER 9-1/2” DIAMETER

PROPERLY DESIGNED SHAFTING TO SUPPORT OVERHUNG LOADS
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4) SHAFT BEARINGS

of the PAST

BABBITTED TYPE BEARINGS

of the PAST

TAIL SHAFT BEARINGS

TAIL SHAFT WITH OUTBOARD BEARINGS

of the PRESENT

SPHERICAL ROLLER BEARINGS
CAST STEEL HOUSINGS
(OPTIONAL TACONITE SEALS)

SPHERICAL ROLLER BRGS.
WITH STEEL HOUSINGS
5) **DRIVE SPROCKETS**

**of the PAST**

ONE PIECE SOLID PLATE SPROCKET

SOLID SPROCKETS / HUBS - VERY DIFFICULT TO REPLACE!

**of the PRESENT**

(3) PIECE SEGMENTED TYPE
MANGANESE ALLOY

(3) PIECE SEGMENTED SPROCKETS

KEYED HUB

(3) PIECE SEGMENTED, ODD NUMBER OF TEETH AND REVERSIBLE SPROCKETS PROVIDES EASY REPLACEMENT AND LONGER WEAR LIFE.
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6) TAIL WHEELS

of the PAST

PLAIN RIM - MAKES CONTACT (WEAR) ON BUSHING / PIN

PLAIN RIM WHEEL - CONTACT WITH BUSHING

WEAR ON CHAIN BUSHING

CRACK

FLANGE RIM - MAKES CONTACT WITH BOTTOM OF CHAIN

CONTACT WITH WHEEL

CONTACT / WEAR ON CHAIN NOT CHAIN BUSHING

SEATED BEARINGS

TRACTOR TYPE WHEEL - “SEATED FOR LIFE”
- FLANGED WHEEL
- CONTACT WITH BOTTOM OF CHAIN
7) CHAIN

of the PAST

- DRY - NON TRACTOR / NON LUBRICATED
- UNLUBRICATED CHAIN AND PINS
- LIGHT DUTY “ENGINEERED CLASS” OUTBOARD CHAIN

of the PRESENT

- SEALED FOR LIFE LUBRICATED
- “SEALEO” TRACK
- “SALT” - SEALED AND LUBRICATED TRACK
- “SALT” - TRACTOR CHAIN
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8) **CHAIN TAKE-UP**

**of the PAST**

FEEDERS OF THE PAST UTILIZED EXPENSIVE SCREW TYPE TAKE-UP FRAMES THAT TYPICALLY WOULD FREEZE-UP AFTER A FEW YEARS AND BECOME INOPERABLE.

**of the PRESENT**

SCREW TYPE WITH PROVISIONS FOR MANUAL HYDRAULIC

UTILIZING TRACK TYPE CHAIN REDUCES CHAIN STRETCH THAT IS COMMON WITH NON-TRACTOR TYPE CHAIN.

**TAKE-UP FRAME ASSEMBLY**

**MANUAL SCREW TYPE TAKE-UP**

ALTHOUGH NOT NECESSARY, MANUAL HYDRAULIC ASSISTANCE CYLINDERS CAN BE PROVIDED IF DESIRED.
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9) CARRY (TOP) ROLLERS

of the PAST

BABBITTED - MANUAL GREASED

OUTBOARD TYPE ROLLERS
- TYPICALLY FOR LIGHT DUTY APPLICATIONS

REGULAR GREASE LUBRICATION REQUIRED BY FITTINGS

of the PRESENT

“SEALED FOR LIFE LUBRICATED”
TRACTOR TYPE ROLLERS

SEALED CARRY ROLLERS

TRACTOR TRACK ROLLERS
SINGLE OR DOUBLE FLANGE

EXCAVATOR TRACK ROLLER
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**10) RETURN (BOTTOM) ROLLERS**

**of the PAST**
RETURN WHEELS MOUNTED ON SHAFT
MANUAL LUBRICATED BEARINGS

**of the PRESENT**
“SEALED FOR LIFE LUBRICATED”
TRACTOR TYPE ROLLERS

OUTBOARD BEARINGS

THRU SHAFT

TRACTOR TYPE
“SEALED FOR LIFE”
REMOVAL FROM OUTSIDE OF FEEDER FRAME (ALONG ACCESS WALKWAY)
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11) PANS (FLIGHTS)

**of the PAST**
- RIVITED TO CHAIN
- LIGHT DUTY DESIGN

**of the PRESENT**
- CAST MANGANESE (HEAVY DUTY)
- FABRICATED STEEL (50 KSI)

CAST MANGANESE PANS ARE TYPICALLY USED FOR ABRASIVE MATERIAL. OVER 500BHN HARDNESS AFTER WORK HARDENING.

SKIRT SEAL BUILT INTO PAN

HIGH STRENGTH FABRICATED STEEL PANS WITH CLOSE TOLERANCE BETWEEN OVERLAP.
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12) IMPACT RAIL

of the PAST

NO IMPACT RAILS SUPPLIED

MANY FEEDERS IN THE PAST AND SOME MANUFACTURES TODAY DO NOT UTILIZE IMPACT RAILS.

of the PRESENT

36” - 54” WIDE PANS (1) IMPACT RAIL
> 60” WIDE PANS (2) or (3) RAILS

PAN DEFLECTION DURING IMPACT

IMPACT RAIL(S) ARE REQUIRED TO LIMIT THE DEFLECTION ON THE PANS DURING HEAVY IMPACT LOADING

CLEARANCE SHOULD BE MAINTAINED BETWEEN THE BOTTOM OF PAN AND IMPACT RAIL

IMPACT RAIL(S)
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13) FRAME

APRON FEEDER FRAMES SHOULD BE DESIGNED FOR ...

- LIVE LOAD FROM MATERIAL & DEAD LOAD FROM BUILD UP OF MATERIAL
- HEAVY IMPACT LOADING
- CROSS MEMBERS WITH CLOSE SPACING
- CONTINUOUS ROLLER SUPPORTS AND IMPACT RAILS/BEAMS
- LIFTING LUGS
- HEAVY DUTY MAIN MEMBERS
- SUPPORTING OF SKIRTS
- PROVISIONS FOR CUSTOMERS SUPPORT
- COLD WEATHER SITE CONDITIONS
- LIFTING OF COMPLETE UNIT
SOME OF THE ACCESSORIES THAT CAN BE FURNISHED WITH AN APRON FEEDER ARE . . .

**DRIBBLE BELT CONVEYOR**

**DRIBBLE DRAG CONVEYOR**

**DRIBBLE DRAG DRIVE**
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14) ACCESSORIES / OPTIONS

Depending on the application, a weigh scale can be incorporated to the apron feeder to make it an “apron weigh feeder”.

- Speed Sensor
- Apron Weigh Feeder
- Roller Weigh Module
- Apron Weigh Feeder Controller
- Scale
- Electrical Junction Box
14) ACCESSORIES / OPTIONS

SKIRTS & DISCHARGE CHUTE

ROD (PIN) GATE

ROD (PIN) GATES ARE USED UNDER BINS OR RECLAIM APPLICATIONS TO STOP MATERIAL FLOW.
14) ACCESSORIES / OPTIONS

LUMP CUTTER (BREAKER)
LUMP BREAKERS / CUTTERS ARE UTILIZED TO BREAK UP WET, STICKY, CLAY-LIKE LUMPS PRIOR TO DISCHARGING OFF THE HEAD TERMINAL END. THEY ARE COMMONLY USED IN THE CEMENT INDUSTRY TO INCREASE FLOWABILITY.
(NOTE: LUMP BREAKERS SHOULD NOT BE USED TO CRUSH ROCK.)
14) ACCESSORIES / OPTIONS

PURGEABLE SEALS

FOR FEEDERS OPERATING IN EXTREMELY DUSTY AND ABRASIVE CONDITIONS, A DUAL FLUSHABLE SEAL IS RECOMMENDED
APRON FEEDER ARRANGEMENTS

APRON FEEDERS ARE GENERALLY INSTALLED IN TWO (2) DIFFERENT CONFIGURATIONS KNOWN AS . . .

♦ “OPEN HOPPER” DESIGN (NO STRIKE-OFF)
♦ “CLOSED HOPPER” DESIGN (WITH STRIKE-OFF)

“OPEN HOPPER” DESIGN IS TYPICALLY USED IN PRIMARY TRUCK DUMP APPLICATIONS WITH A RECEIVING HOPPER.

OPEN HOPPER DESIGN MEANS THERE IS NO SHEAR BAR OR STRIKE-OFF PLATE TO ESTABLISH THE BED DEPTH.

COMMONLY INSTALLED AT 15 - 23 DEGREES INCLINATION FROM THE HORIZONTAL.

ADVANTAGES OF THE INCLINATION IS TO PROVIDE FOR MORE MATERIAL STORAGE IN THE HOPPER.
“CLOSED HOPPER” DESIGN IS TYPICALLY USED IN SECONDARY & TERTIARY APPLICATIONS. HOWEVER, IT IS NOT UNCOMMON TO USE IN PRIMARY APPLICATIONS IF . . .

→ A SHEAR BAR (STRIKE-OFF) IS INCORPORATED TO ESTABLISH THE BED DEPTH AND FEEDER SPEED.

→ ADVANTAGE OF A SHEAR BAR IS MORE ACCURATE FEED RATE.

→ COMMONLY INSTALLED HORIZONTALLY

→ ADVANTAGE OF HORIZONTAL INSTALLATIONS ARE LESS HEAD ROOM, SIMPLER DESIGN OF SUPPORT STRUCTURE & ACCESS.

NOTE: A BED OF MATERIAL IS ALSO RECOMMENDED TO DISTRIBUTE DIRECT IMPACT AND TO REDUCE SPILLAGE OF FINES BETWEEN THE SKIRTS AND PANS.
AFTER ALL OF THE GENERAL APPLICATION DATA IS KNOWN, PROPER SIZING, SELECTION OF CHAIN AND SPEED / POWER REQUIREMENTS CAN BE DETERMINED.

TOTAL REQUIRED CHAIN PULL IS DETERMINED BY CALCULATING THE FOLLOWING SUB-POWER DEMANDS HP1 thru HP7 AS SHOWN BELOW.

<table>
<thead>
<tr>
<th>Chainpull (pounds)</th>
<th>Horsepower (HP)</th>
<th>Percent of total HP</th>
</tr>
</thead>
<tbody>
<tr>
<td>HP1 - to convey material @ L2</td>
<td>5,951</td>
<td>6.97</td>
</tr>
<tr>
<td>HP2 - to convey material @ L3</td>
<td>1,337</td>
<td>1.57</td>
</tr>
<tr>
<td>HP3 - to move chain &amp; pans</td>
<td>1,584</td>
<td>1.86</td>
</tr>
<tr>
<td>HP4 - resistance @ terminals</td>
<td>1,320</td>
<td>1.55</td>
</tr>
<tr>
<td>HP5 - shear resistance @ hopper</td>
<td>27,989</td>
<td>32.78</td>
</tr>
<tr>
<td>HP6 - skirtboard friction</td>
<td>2,215</td>
<td>2.59</td>
</tr>
<tr>
<td>HP7 - elevate material</td>
<td>8,036</td>
<td>9.41</td>
</tr>
<tr>
<td><strong>TOTALS</strong></td>
<td><strong>48,433</strong></td>
<td><strong>56.72</strong></td>
</tr>
</tbody>
</table>

NOTE: LARGE PERCENTAGE OF TOTAL DEMAND IS TYPICALLY THE RESISTANCE TO SHEAR THE MATERIAL AT THE HOPPER DISCHARGE / SKIRT FEED SECTION.
AFTER THE TOTAL CHAIN PULL (Pt) HAS BEEN CALCULATED, THE SIZE OF TRACTOR CHAIN CAN THEN BE DETERMINED.

NOTE: THE TOTAL CHAIN PULL (Pt) WILL BE SHARED BETWEEN TWO (2) STRANDS OF CHAIN.

\[
\text{SINGLE CHAIN PULL} = \frac{Pt \text{ (total chain pull)}}{2 \text{ strands of chain}}
\]

INDUSTRY STANDARD IS TO MAINTAIN A MINIMUM WORKING STRENGTH SAFETY FACTOR OF 4.2 - 5.0 ON THE CHAIN ULTIMATE TENSILE STRENGTH.

<table>
<thead>
<tr>
<th>MODEL</th>
<th>CHAIN SIZE</th>
<th>CHAIN PITCH IN. (mm)</th>
<th>CHAIN WT. per PITCH LBS. / (kg) each</th>
<th>ULTIMATE STRENGTH LBS.</th>
</tr>
</thead>
<tbody>
<tr>
<td>AF4</td>
<td>FL4</td>
<td>5.5118 (140)</td>
<td>15 (6.8)</td>
<td>90,550</td>
</tr>
<tr>
<td>AF5</td>
<td>D4</td>
<td>6.75 (171)</td>
<td>18.4 (8.4)</td>
<td>190,000</td>
</tr>
<tr>
<td>AF8</td>
<td>D6</td>
<td>8.0 (203)</td>
<td>29.5 (13.4)</td>
<td>275,000</td>
</tr>
<tr>
<td>AF10</td>
<td>D7</td>
<td>8.50 (216)</td>
<td>41.1 (18.7)</td>
<td>320,000</td>
</tr>
<tr>
<td>AF12</td>
<td>D8</td>
<td>9.0 (229)</td>
<td>59 (26.8)</td>
<td>395,000</td>
</tr>
<tr>
<td>AF14</td>
<td>D9</td>
<td>10.25 (260)</td>
<td>84.2 (38.3)</td>
<td>790,000</td>
</tr>
<tr>
<td>AF16</td>
<td>D10</td>
<td>10.25 (260)</td>
<td>110 (4.3)</td>
<td>970,000</td>
</tr>
<tr>
<td>AF18</td>
<td>D11</td>
<td>12.5 (317)</td>
<td>164 (74.5)</td>
<td>1,300,000</td>
</tr>
</tbody>
</table>
APRON FEEDERS ARE INSTALLED EXTENSIVELY UNDER TRUCK DUMPS TO FEED LARGE MATERIAL TO PRIMARY CRUSHERS.

APRON FEEDER DISCHARGING LIMESTONE TO A CRUSHER.
APRON FEEDERS ARE USED TO RECEIVE MATERIAL FROM RECEIVING HOPPER TO FEED WOBBLER FEEDERS AND CRUSHERS.
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GENERAL ARRANGEMENT

APRON FEEDERS ARE USED TO FEED PRIMARY CRUSHERS AT A CONTROLLED RATE OF SPEED FROM TRUCK DUMP LOADING.

120” WIDE APRON FEEDER INSTALLED IN INDIA FEEDING ROM IRON ORE FROM A TRUCK HOPPER TO GYRATORY CRUSHER

114” WIDE
APRON FEEDERS ARE USED UNDER PRIMARY CRUSHERS TO CONTROL MATERIAL IMPACT AND TO FEED THE PRODUCT TO CONVEYORS.

120” WIDE APRON FEEDER INSTALLED IN ARGENTINA UNDER A CRUSHER.
APRON FEEDERS ARE USED TO RECEIVE MATERIAL FROM RECEIVING HOPPER TO FEED GRIZZLY SCREENS AND CRUSHERS.

APRON FEEDER UNDER A HOPPER RECEIVING GOLD ORE IN GHANA, W.A.
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GENERAL ARRANGEMENT

APRON FEEDERS USED TO RECEIVE COARSE GYPSUM ORE FROM RECEIVING HOPPER TO FEED GRIZZLY SCREEN AND CRUSHER.

1000 TPH APRON FEEDER UNDER A TRUCK DUMP HOPPER AT A US GYPSUM PLANT LOCATED IN CA.
60” WIDE FEEDER x 18’ LONG w/ 25HP HYD. DRIVE
APRON FEEDERS ARE USED TO RECEIVE MATERIAL FROM RECEIVING HOPPER TO FEED WOBBLER FEEDERS AND CRUSHERS.

QUARRY OPERATION IN ISRAEL
APRON FEEDER UNDER A HOPPER RECEIVING ROCK / MUD and DISCHARGING INTO A WOBBLER FEEDER
APRON WEIGH FEEDERS ARE INSTALLED UNDER STORAGE SILOS TO EXTRACT AND WEIGH MATERIAL PRIOR TO BEING BLENDED FOR THE FINAL PRODUCT.
ILLUSTRATION OF A FLOW DIAGRAM NOT USING AN APRON WEIGH FEEDER.

NOTE! THE ADDITIONAL EQUIPMENT AND SPACE THAT IS REQUIRED TO WEIGH THE MATERIAL.
ILLUSTRATION OF A FLOW DIAGRAM UTILIZING AN APRON WEIGH FEEDER.

NOTE! LESS VERTICAL HEIGHT TO INSTALL THE UNIT AND THE ELIMINATION OF EQUIPMENT AND A TRANSFER POINT.
APRON FEEDERS ARE INSTALLED UNDER STORAGE SILOS TO PROVIDE A CONTROLLED RATE OF MATERIAL FEED TO OTHER EQUIPMENT.

APRON FEEDER INSTALLED UNDER A GOLD ORE SILO.
APRON FEEDERS ARE INSTALLED UNDER STORAGE HOPPERS TO PROVIDE A CONTROLLED RATE OF MATERIAL FEED TO OTHER EQUIPMENT.
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**GENERAL ARRANGEMENT**

RECLAIM STORAGE AREAS UTILIZE APRON FEEDERS FOR EXTRACTING COARSE MATERIAL FROM STORAGE AND FEEDING IT TO BELT CONVEYORS.

APRON FEEDERS INSTALLED UNDER STOCKPILE.
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**GENERAL ARRANGEMENT**

**RECLAIM STORAGE AREAS UTILIZE APRON FEEDERS FOR EXTRACTING COARSE MATERIAL FROM STOCKPILES AND FEEDING ON TO CONVEYORS.**

![Diagram showing the arrangement of stockpile, reclaim conveyor, and apron feeders.]

- **STOCKPILE**
- **RECLAIM CONVEYOR**
- **APRON FEEDERS**

**APRON FEEDERS INSTALLED UNDER A STOCKPILE**
APRON FEEDERS are used in various material handling applications to receive material from wheelloaders and feed conveyors.
Reclaim storage areas utilize apron feeders for extracting coarse material from storage and feeding it to belt conveyors.

Reclaim apron feeders installed under stockpile to reclaim additive material.

Variable speed drives.
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GENERAL ARRANGEMENT

APRON FEEDERS ARE USED AT POWER PLANTS UNDER BARGE UNLOADING RECEIVING HOPPERS TO FEED STOCKPILE FEED TRANSFER BELT CONVEYORS

CRANE
RECEIVING HOPPER
APRON FEEDER
DISCHARGE OF APRON FEEDER
MECHANICAL VF DRIVE
APRON FEEDER INSTALLED UNDER HOPPER
APRON FEEDERS ARE USED IN UNDERGROUND MINING APPLICATIONS TO FEED SKIP BUCKETS OR DISCHARGING ABOVE GROUND INTO HOPPERS.

APRON FEEDERS ARE TYPICALLY USED FOR ROM APPLICATIONS.

RECEIVING BUNKER

SKIP BUCKET FEED
APRON FEEDERS ARE USED IN UNDERGROUND MINING APPLICATIONS TO EXTRACT STORED RAW MATERIAL FROM BUNKER OR SILOS (GLORY HOLES).

APRON FEEDERS ARE THE ONLY TYPE OF FEEDER THAT CAN TAKE THE ABUSE AND IMPACT IN A GLORY HOLE APPLICATION.
APRON FEEDERS ARE USED IN UNDERGROUND CRUSHING APPLICATIONS TO EXTRACT STORED RAW MATERIAL FROM BUNKER OR SILOS (GLORY HOLES) TO FEED MATERIAL DIRECTLY INTO CRUSHERS.

APRON FEEDERS ARE THE ONLY TYPE OF FEEDER THAT CAN TAKE THE ABUSE AND IMPACT IN A GLORY HOLE APPLICATION.
APRON FEEDERS ARE USED TO RECEIVE MATERIAL FROM RECEIVING HOPPER TO FEED GRIZZLY SCREENS AND CRUSHERS.

APRON FEEDER UNDER A TRUCK HOPPER RECEIVING COPPER ORE IN PERU.
APRON FEEDERS ARE UTILIZED TO LOAD RAILROAD CARS OR MINE CARS DIRECTLY WITH A CONTROLLED RATE OF FEED FROM STORAGE POCKETS.

CHAIN CURTAIN
APRON FEEDERS INSTALLED UNDER STORAGE POCKET TO RECLAIM IRON ORE
GENERAL ARRANGEMENT

APRON FEEDERS ARE INSTALLED UNDER RAIL CAR DUMPERS TO FEED LARGE MATERIAL TO CONVEYORS OR PRIMARY CRUSHERS. AN APRON FEEDER IS UTILIZED TO WITHSTAND THE IMPACT OF MATERIAL.
Evolution of Design and Applications of Apron Feeders

Martin A. Yester - Senior Applications Engineer
Metso Minerals - Minerals Processing
Bulk Material Handling Division, Pgh., PA USA