SGS MECHANICAL SAMPLING SYSTEMS
SGS has manufactured and supplied mechanical sampling equipment (MSS) primarily in Australia, Asia, and Europe for over 20 years. SGS cross-belt samplers are re-engineered and the design significantly updated and improved supply superior, yet cost effective systems.
CROSS BELT SAMPLER DESIGN FEATURES

- Available to fit any size, speed or capacity belt, metric or imperial
- Large range of top sizes can be accommodated
- Heavy duty cutter and enclosure construction
- Detailed engineering of mechanical components
- Direct drive
- Fluid shear brake
- Adjustable skirt-boards
- Non-stick spiral enclosure
- Closed loop speed and position control available
- Hydraulic drive options available
VALUE OF INTEGRATED PILOT PLANTS

**Ultra heavy duty components for long life**

**Engineered to minimize weight without compromising sample integrity**

**Engineered to accommodate worst case loading**

**Conservative safety factors**

**Standard stainless steel cutter body**

**Counterweighted for balance and increased inertia**

**Counterweight eliminates the forces on the customer’s structure resulting from an eccentric cutter load if no counter weight is used**

**Belt wiper ensures complete increment collection**
CAREFULLY SIZED COMPONENTS

- Drive components custom selected for each application.
- All components selected for durability.
- Components are oversized to handle the harshest conditions.
- Shock loading and fatigue are primary design considerations.
### Dynamic Analysis

#### Gearbox Data

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Center Distance (C)</td>
<td>27.751 in</td>
</tr>
<tr>
<td>Gear Ratio</td>
<td>9.509</td>
</tr>
<tr>
<td>Rotation Speed</td>
<td>2774 RPM</td>
</tr>
<tr>
<td>Clearance Radius (r)</td>
<td>3.750 in</td>
</tr>
<tr>
<td>Target RPM</td>
<td>85.572 RPM</td>
</tr>
<tr>
<td>Overall Shaft Length</td>
<td>27.750 in</td>
</tr>
<tr>
<td>Overall Shaft Length</td>
<td>27.750 in</td>
</tr>
<tr>
<td>Overall Shaft Diameter</td>
<td>2 in</td>
</tr>
<tr>
<td>Overall Shaft Diameter</td>
<td>2 in</td>
</tr>
</tbody>
</table>

#### Gearbox Characteristics

- **Acceleration Phase**
  - First Stage: 2.032 hr
  - Second Stage: 2.032 hr

- **Peak Input**
  - Peak Input: 75000 hp

#### Torque and Power

- **Torque to Accelerate Sample**
  - 500.794 ft-lb

- **Max Full Cycle Torque**
  - 2940.090 ft-lb

- **Max Power Torque at Motor Shaft**
  - 90.990 ft-lb

#### Component Forces

- **Force on Motor Shaft**
  - 610.794 lb

#### Other Physical Parameters

- **Diameter**
  - 2 in

- **Length**
  - 27.750 in

- **Torque to Accelerate Sample**
  - 500.794 ft-lb

- **Peak Input**
  - 75000 hp

- **Max Full Cycle Torque**
  - 2940.090 ft-lb

- **Max Power Torque at Motor Shaft**
  - 90.990 ft-lb

- **Force on Motor Shaft**
  - 610.794 lb

#### Gear Ratio

- **First Stage Gear Ratio**
  - 3.750

- **Second Stage Gear Ratio**
  - 3.750
- Nearly eliminates brake maintenance
- Superior stopping capability and response time (<10ms!)
- Potted electric components for superior durability
DIRECT DRIVE

- Direct drive eliminates the clutch-brake
- Less maintenance
- Longer system life
- Fewer components to stock

- Ultra Heavy-Duty Bearings
- Grid Coupling
- Fluid Shear Brake
- Gearmotor
ENCLOSURE FEATURES

- Double Sided Access Doors
- All Moving Parts Guarded
- Adjustable Skirt Boards and Striker Plates (not shown)
- Chute Access Panel
- Stainless Discharge Chute
ADJUSTABLE SKIRT BOARDS AND STRIKER PLATES

- Collect all the increment, all the time
- Striker plates ensure only the material within the cutter is collected with the increment.
- Reduce bias, error, and dust
- No residual sample material left on belt
- Keep all non-sample material on the belt, eliminate spillage
- Conforms to ISO, ASTM and other international standards
SIDE HINGED ACCESS DOORS

- Allow for easy access without leaning into enclosure
- Electrical safety interlock to prevent operation when doors are open
- Lockable to prevent unauthorized access

Easy Cutter and Wiper Access
SPIRAL ENCLOSURE

- Material impacts walls at 65° angle
- Prevents ‘mushrooming’ and sticking of sample on enclosure walls
- Maintains material velocity all the way to the discharge flange
CHUTE INSPECTION DOOR

- Easy chute or cutter access
- Lockable latches
- Inner liner to keep inside of enclosure as flat as possible, reducing places for material to stick
CIRCULAR IMPACT BED

- Conforms belt perfectly to cutter trajectory (training idlers not shown)
- Ensures that no material is left behind by the cutter
- Extra protection along skirt boards to prevent material loss as spillage
Shaft encoder integrated with fluid shear brake or hydraulic motor
- Allows for real-time feedback to control software
- Operational speed can be verified and an alarm can be triggered if the correct speed is not reached in the designated angle
- Any slowing through material can be monitored and accounted for, an alarm can be triggered if conditions change out of nominal parameters
- Dynamic acceleration and braking control reduces stress on components
- Park position and acceleration/braking curves precisely defined and monitored, no ‘timer based’ motion control
- No ‘tuning’ necessary once system is set up
OPTIONAL HYDRAULIC DRIVE

- Extreme duty drive
- Fully dynamic motion control
- Extreme torque and shock capacity
- 100% thermal control for full response in any environment
- Very low maintenance
- No need for a gearbox or separate brakes (holding brake and stopping brake included)
- Complete integrated solution
  - Motor
  - Power unit
  - Hydraulic controls
  - Hydraulic system health monitoring
OPTIONS TO MITIGATE HARSH ENVIRONMENT

- Fully stainless steel systems
- Wash-down rated equipment
- Explosion proof electrics (Hazardous environment conditions)
- Epoxy coated components (Highly corrosive applications)
- Galvanized framework
- Stainless hardware
CROSS BELT SAMPLERS – DESIGN RULES

- **Rule 1:** The cutter aperture must travel at a 90 degree angle to the centerline of the belt being sampled.

- **Rule 2:** The cutter aperture width must be no less than three times the nominal top size of the material (3d).

- **Rule 3:** The arc formed from the leading edge to the trailing edge of the sidewalls must be sufficient for the cutter to cover the width of the material on the belt at full CEMA loading.

- **Rule 4:** The cutter must pass through the entire stream of material during one continuous operation with a minimum cutter velocity at the tip of the cutter near the belting of 1.5 times the velocity of the belt.

- **Rule 5:** Striker plates for prohibiting the entry of non-sample material must be installed on both the upstream and downstream sides of the cutter exit opening with gaps between the exiting cutter and striker plate held to no more than 10 mm.

- **Rule 6:** The underlying belting must be securely supported in such a way as to conform the belting to the cutter path (a circle).
Rule 7: The gap between the cutter side plates and the conveyor belting must not be greater than 10 mm at any point across the belt.

Rule 8: The cutter must be equipped at the rear with an effective and durable wiper that cleanly scrapes the belting.

Rule 9: The cutter must not be fitted with internal supports that could interfere with material entering or exiting the cutter.

Rule 10: All cutters for belt sizes 900 mm and larger must be counterweighted. This avoids potential structural problems with the conveyor belt.

Rule 11: All material delimited by the cutter and none other, must be included in the sample.

Rule 12: No material shall remain in the cutter after the cutter has collected and discharged an increment. This is to be verified visually and by tests of the sampling ratio.
SGS MECHANICAL SAMPLING SYSTEMS

- Fully turn-key sampling systems
  - Samplers (Primary, Secondary, Tertiary)
    - Cross Belt
    - Falling Stream
    - Auger
  - Feed and Discharge Belts
  - All Chute work
  - Power, Instrumentation and Control Integration with Existing Systems
On-Line Analyzer incorporated into the system.
COMPLICATED INTEGRATION OF A MSS INTO AN EXISTING FACILITIES

- Primary sampler mounted on a loading boom that is raised and lowered.
OTHER SGS MECHANICAL SAMPLING SYSTEM SERVICES

- Bias Testing of Sample Systems
- Sampling System Inspection Services
- Engineering Studies to design and justify
- Field installation and Project management
- Integration of On-Line Analyzers into the system
- Operation and maintenance services