Challenges and opportunities in fluid power for agriculture machines

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Overview

- 2\textsuperscript{nd} largest agriculture equipment manufacturing in the World
- A member of FIAT GROUP
- 2 main brands:

Brazil Factories:
- Sorocaba / SP
- Curitiba / PR
- Piracicaba / SP
Disposition
Challenges and opportunities in fluid power for agriculture machines

- Brazilian agriculture scenario
- Challenges for this scenario
- How fluid power is embedded in Agriculture Machines
- How to use fluid power to increase productivity
- Trends of fluid power in agriculture machines
Brazilian agriculture scenario

Facts & Statements

Brazil is among the world’s 10 largest economies
• 5th highest population (now over 200 million) and the 5th largest surface area.

Brazilian agriculture → growth for over 3 decades.
• Total agricultural has doubled in volume compared to its level in 1990

Agriculture in Brazil is an important contributor to the country’s energy supply.
• sugarcane biomass (42%)
• firewood (20%)
• and other sources (10%).
Brazilian agriculture scenario

Facts & Statements

Agricultural frontier in the Centre-West and Northern regions.
• increased productivity

High prices for agricultural commodities
• 3.5% real GDP growth per year between 2005 and 2013.

Growth remains hampered by structural weaknesses in the economy
• weak infrastructure
• high indirect tax system
• low levels of education and skills.
Brazilian agricultural scenario

Higher demand for food

Brazil’s agro-food trade, 1995-2013

Source: UN Comtrade Database (2013).
Brazilian agricultural scenario

Higher demand for food

Trends in agricultural output and Total Factor Productivity in Brazil, 1975-2013

Source: Gasques et al. (2014).
Brazilian agricultural scenario

Harvest areas migration in Brazil

**Brazilian Agriculture Evolution and Regional Profile**

- **Midwest / Mapitoba**
  - New Agriculture frontier emerging with the migration of farmers from the south.
  - Area expansion to some states of Northeast area, recently nominated “Mapitoba” represents the new wave of Brazilian agriculture.
  - Basically plane topography.

- **South/Southeast**
  - The Brazilian agriculture activities started in the south and southeast regions.
  - Even considering new areas expansion in other states, the region still have a significant weight in the national agriculture.
  - Topography basically marked by rough reliefs.
Brazilian agricultural scenario

Crop production areas

Brazil’s Crop production areas

Brazilian agricultural scenario
Trends for crop production

Trend in land used for crop production in Brazil

Challenges of Agricultural Scenario
Small to Big farms

- Lack of skilled operators at remote areas
  - Electronics and Hydraulics requires proper training

- Shorten harvesting window
  - Harvest as quick as possible for second season planting

- Improve bottom line users profitability
  - Unstable weather conditions

- Higher reliability on machines
  - Easy to use equipment with quick maintenance

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Challenges of Agricultural Scenario

What are the challenges for Brazil’s Agriculture?

- Higher demand for food
- Opening of new planting areas are decreasing

How to increase productivity?

CNH Industrial is leading this change
Fluid power in Agriculture Machines
Percentage of hydraulic control (among all functions)

15-30%
15-40%
40-50%
40-60%
70-85%
Fluid power in Agriculture Machines
Sugar cane Harvester

- 9 hydraulic pumps
- 1500 lpm flowing
- 285 kW consumed
- 28 hydraulic motors
- 2 hydrostatic motors
- 9 cylinders
- 312 hoses
- 9 control manifold
- Harvesting 700 to 800 tons of sugar cane per machine per day!
Fluid power to increase productivity

40 ROW Plantes → 18 meters of length

- Seed and Fertilizer variable ratio control
- Autoguidance with LS-Non reaction Steering unit
- Vacuum fan and bulk fill fan with axial piston motors
- Pneumatic down force control
- Bulk Fill System
- Improve CNH Tractor / Planter Hydraulic Interface
Fluid power to increase productivity

Tractor x Planters integration → Larger Remote Valves

Q = 90 lpm
Q = 150 lpm
Q = 225 lpm
Q = 428 lpm

Future Q = ???

GEAR PUMP

VARIABLE DISPLACEMENT PUMP
Fluid power to increase productivity
Rationalization
Fluid power to increase productivity

Rationalization

- Less parts handling
- Minor leakage points
- Better layout design
- Better cost x benefit solution
- Minor pressure drops and power consumption from hydraulic system.
Fluid power to increase productivity
New products to increase productivity

CVT Transmission
✓ Infinite gear ratios → perfect balance of power and efficiency
✓ The best gear ratio through varying conditions,
✓ Improved fuel economy and more efficient performance.

Front Axle Suspension
✓ Tires on the ground → crucial for stability and efficient performance
✓ Better ride at higher speeds.
✓ Avoid from bouncing and jarring in the cab
Fluid power to increase productivity

GPS & Precision Agriculture

- High demand of precision agriculture
  - Automated Steering systems
  - Sprayer overlapping, planter overlapping (variable rate control)
    - Individual nozzle control
  - Machinery fleet control and synchronization;
Trends of fluid power in agriculture

Components

Valves
- Open Center
- Manually operated
- Soneloid valves
- Medium flow
- Manual operation
- Troubleshooting

Manifolds
- Closed Center
- Electronic operated
- Proportional Control valves
- High flow pumps and systems
- Remote (pilot) operation
- Telemetrics
THANK YOU!
Backup