

ENERGY CONSUMPTION FOR CANOLA CRUSHING

Prepared For:

CANADIAN OILSEED PROCESSORS ASSOCIATION
404 – 167 Lombard Avenue
Winnipeg, Manitoba
R3B 0T6
CANADA

Prepared By

(S&T)² Consultants Inc.
11657 Summit Crescent
Delta, BC
Canada, V4E 2Z2

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EXECUTIVE SUMMARY

The Canola Oilseed Processors Association (COPA) is a federally incorporated non-profit industry association that works in partnership with the Canola Council of Canada (CCC) to represent the interests of oilseed processors in Canada.

The purposes of the corporation are:

- To act as an industry association to the Canadian oilseed processing industry.
- To promote the processing of oilseeds in Canada.
- To provide a forum for the discussion of matters pertaining to the Canadian oilseed processing industry.
- To act on behalf of its members by making representations to governmental or other authorities on all matters pertaining to the Canadian oilseed processing industry.

There are 14 oilseed crushing facilities in Canada. The plants in Western Canada process canola seeds and the plants in eastern Canada process canola and soybeans. The plant locations are shown in the following figure.

Periodically COPA surveys its members to track energy use at the facilities.

Three of the 14 facilities process both canola and soybeans and these facilities have not been included in this analysis.

The energy consumption can vary with the canola seed properties which can vary year to year with the growing conditions. To accommodate the annual variations the results from 2021 to 203 are averaged in this report. The results of the survey are shown in the following tables

Table ES- 1 Energy Data

Source	Total	Per tonne of seed processed
Natural Gas, GJ (HHV)	8,669,203	0.99
Electricity, kWh	379,241,928	43.35

The energy data can also be presented in the format required for the GREET model, where the units are BTU (LHV) and pounds. The information is shown in the following table.

Table ES- 2 Energy Data for GREET

Source	Per Pound of Oil Unallocated
Natural Gas, BTU (LHV)	914
Electricity, BTU	160
Total Energy, BTU	1,073

TABLE OF CONTENTS

EXECUTIVE SUMMARY	I
TABLE OF CONTENTS.....	II
LIST OF TABLES	II
LIST OF FIGURES	II
1. INTRODUCTION	1
1.1 CANADIAN CANOLA CRUSHING INDUSTRY	1
2. CANOLA CRUSHING PROCESS.....	3
2.1 CRUSHING DATA	4
3. ENERGY USE	6
3.1 THERMAL ENERGY PURCHASES.....	6
3.2 ELECTRICITY PURCHASES	6
3.3 ENERGY SUMMARY	6

LIST OF TABLES

TABLE 2-1 CANOLA CRUSH DATA.....	4
TABLE 2-2 OIL RECOVERY	5
TABLE 3-1 ENERGY DATA	6
TABLE 3-2 ENERGY DATA	6

LIST OF FIGURES

FIGURE 1-1 OILSEED CRUSHING FACILITIES IN CANADA.....	1
FIGURE 2-1 OILSEED CRUSHING PROCESS	3

1. INTRODUCTION

The Canola Oilseed Processors Association (COPA) is a federally incorporated non-profit industry association that works in partnership with the Canola Council of Canada (CCC) to represent the interests of oilseed processors in Canada.

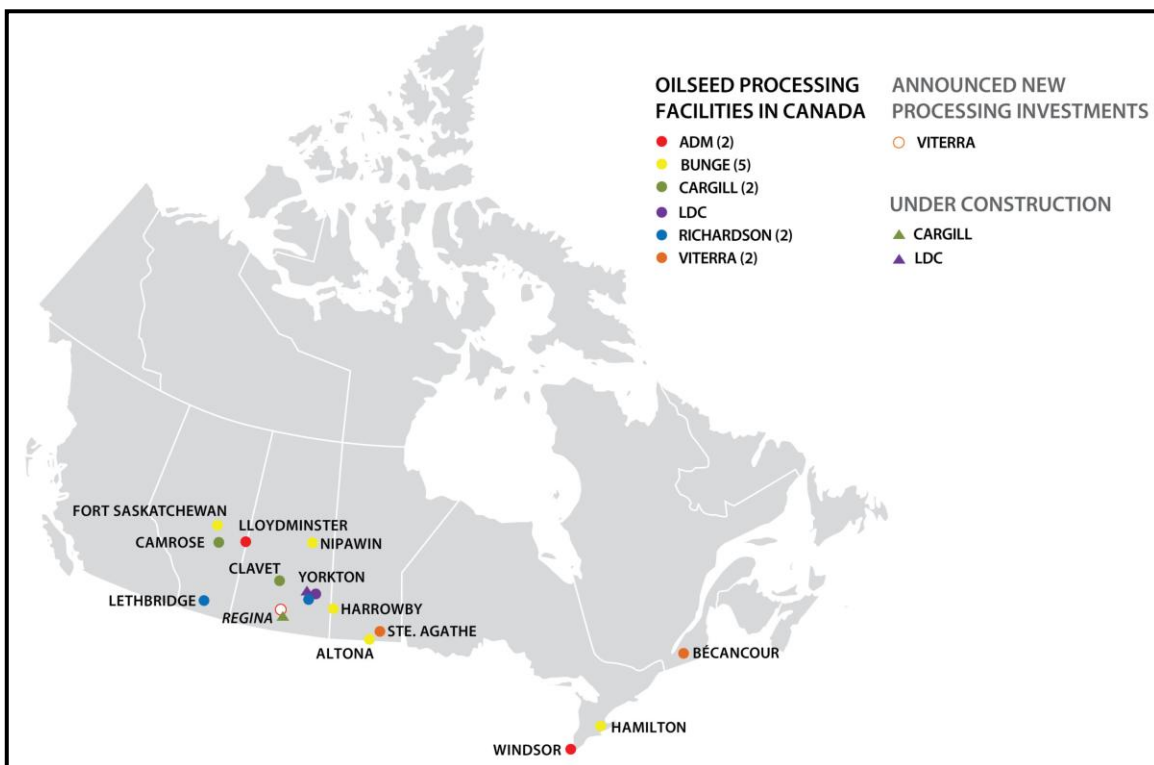
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1.1 CANADIAN CANOLA CRUSHING INDUSTRY

There are 14 oilseed crushing facilities in Canada. The plants in Western Canada process canola seeds and the plants in eastern Canada process canola and soybeans. The plant locations are shown in the following figure.

Figure 1-1 Oilseed Crushing Facilities in Canada



Periodically COPA surveys its members to track energy use at the facilities.

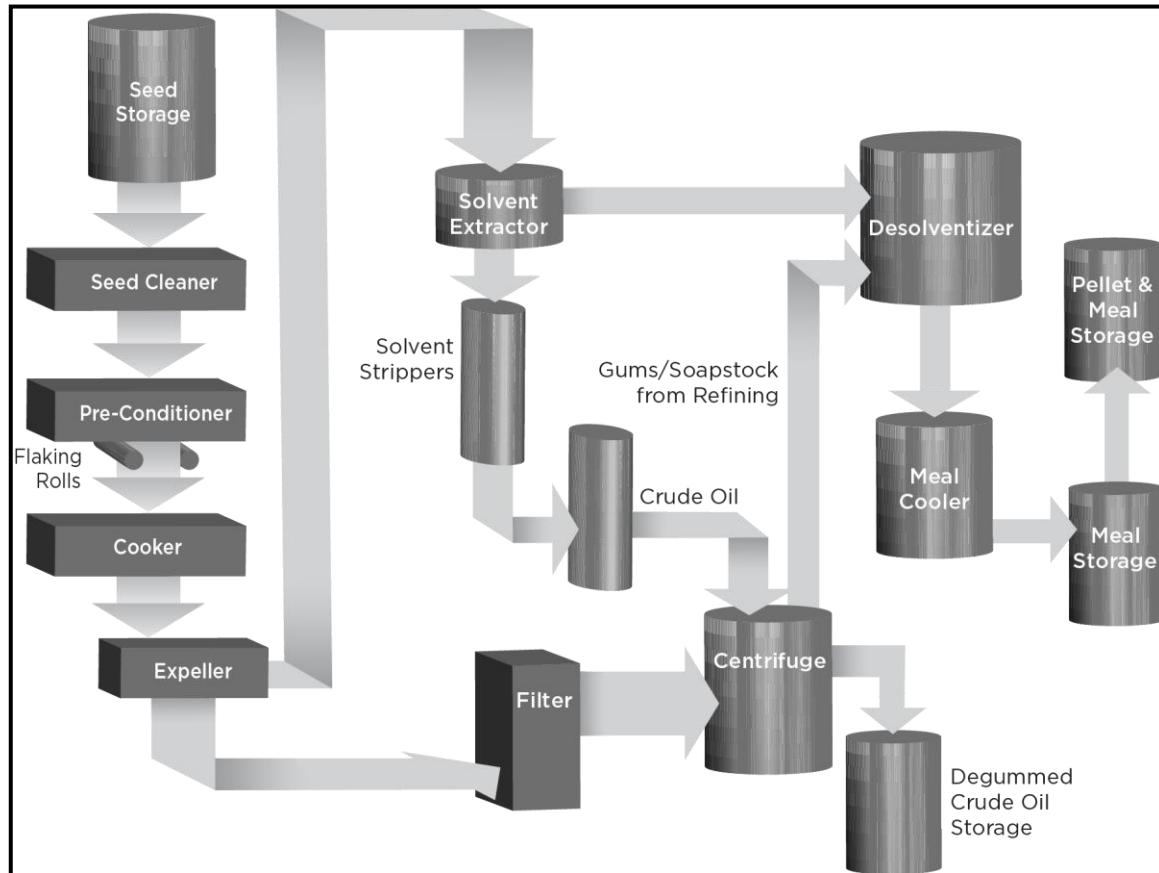
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2. CANOLA CRUSHING PROCESS

The process for turning canola seed into oil and meal is similar to how other oilseeds are processed. Seed is preconditioned and pressed to separate the oil from the solids. Further refining and processing create finished canola products, ready for the market or further processing. The process is shown in the following figure.

Figure 2-1 Oilseed Crushing Process



The steps in the process are briefly described below.

Cleaning

First canola seed is thoroughly cleaned to remove “dockage” – weed seeds, stems, pods and other materials that may be picked up as canola is harvested.

Heating and flaking

Canola is heated and flaked before extraction so more oil can be released. The temperature is slightly raised in grain dryers to prevent shattering. The seed is then passed through rollers to gently rupture the cell walls and flake the seed to just the right thickness.

Seed cooking

Next the flakes go through a series of heating drums or stack-type cookers. This ruptures more cells and optimizes the viscosity of the oil and moisture of the flakes for the processes ahead. Cooking also prevents the breakdown of products that could affect quality.

Pressing

The cooked flakes then go through a series of screw presses or expellers for a mild pressing. This process removes most of the oil and compresses the rest of seed into cake.

Solvent extraction

To remove the remaining oil, the presscake is put into an extractor and saturated with an approved food-grade solvent called hexane. The solvent percolates through the cake and separates nearly all of the remaining oil. The hexane is then removed from the oil and solids, reused and recycled.

Further oil refining and processing

Crude canola oil is further refined to improve colour, flavour and shelf life. Water and organic acids may be used to remove lipids, gums, free fatty acids and fine meal particles. Color pigments are removed by passing oil through a filter containing natural clay (a process sometimes called “bleaching,” although no bleach is used). The final step is to remove any unpleasant odours or compounds with steam distillation.

At this point, canola oil is ready to be packaged and sold as cooking oil, or further processed into a wide range of consumer and commercial products.

Meal processing

After the oil has been removed, the remaining solids are processed into canola meal, a protein source used in animal feed. The meal is placed on heated plates and injected with live steam – a process called toasting – to remove the remaining solvent. After it has been cooled, dried and granulated, the meal may be pelleted or sent directly to storage.

2.1 CRUSHING DATA

The eleven ‘canola only’ crush facilities produced crude canola oil, refined canola oil, and canola meal. The ratio of crude canola oil to refined canola oil varies between facilities and the facilities do not all have the capacity to separate the energy consumed between crude and refined canola oil. The energy consumption data presented in the next section does not differentiate between the two grades of canola oil. Over time the percentage of the canola oil that is refined has been increasing.

The average data for the 2021 to 2023 period is shown in the following table.

Table 2-1 Canola Crush Data

Parameter	Value
Canola Seed processed, tonnes as received	8,749,820
Crude canola oil produced, tonnes	3,672,297
Refined canola oil produced, tonnes	2,532,006
Canola Meal produced, tonnes as produced	5,067,343

The industry standard moisture content is 8.5% for the seed. The actual moisture content is usually between 7.5 and 8.0%.

The industry standard moisture for the meal is 12%.

The oil recovered on a dry weight basis is shown in the following table.

Table 2-2 Oil Recovery

Parameter	Value
Dry weight processed, tonnes	8,006,085
Oil recovered, tonnes	3,672,297
Recovery rate, %	45.9

3. ENERGY USE

The energy required for the crushing process includes thermal energy and electrical energy. Both are discussed below.

3.1 THERMAL ENERGY PURCHASES

The 11 facilities all utilize natural gas for their thermal energy requirements. A few facilities have co-generation equipment so some or all of the electricity consumed in the process is supplied internally.

3.2 ELECTRICITY PURCHASES

Only the electricity purchased from the local utility is included in the data provided. The electricity consumed that is provided by cogeneration is accounted for in the natural gas purchases.

3.3 ENERGY SUMMARY

The energy Data is presented in the following table.

Table 3-1 Energy Data

Source	Total	Per tonne of seed processed
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Table 3-2 Energy Data for GREET

Source	Per Pound of Oil Unallocated
Natural Gas, BTU (LHV)	914
Electricity, BTU	160
Total Energy, BTU	1,073

The actual energy consumption is 86% of the value in GREET 2024.